INTERSTATE 405 Corridor Program
Congestion Relief & Bus Rapid Transit Projects

APPENDIX E10

I-405, SR520 to SR522 Kirkland Nickel Air Quality Discipline Report

I-405, SR520 to SR522 Stage 1 (Kirkland Stage 1)

Request For Proposal
July 15, 2005

Washington State Department of Transportation

I-405, SR 520 to SR 522 - Kirkland Nickel Project

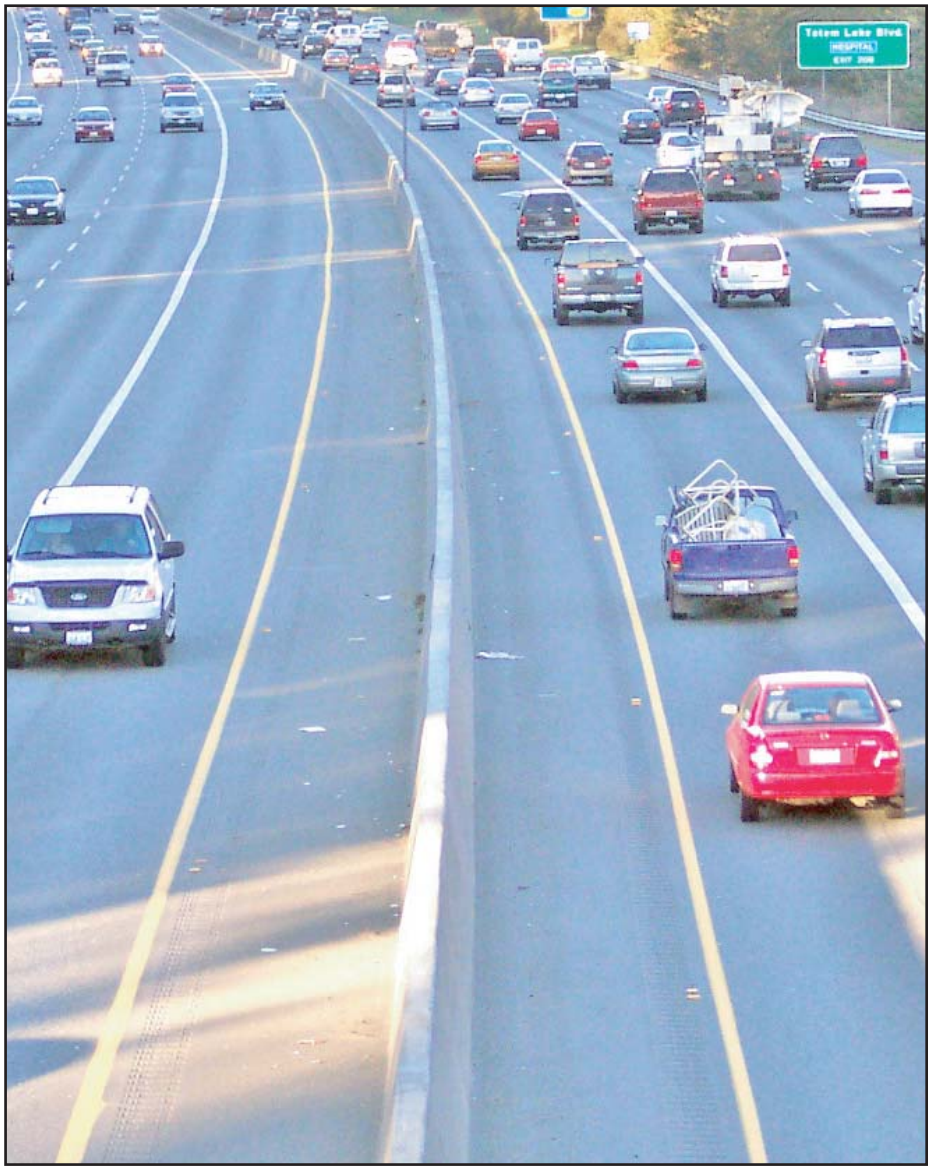
Corridor Program
Congestion Relief & Bus Rapid Transit Projects

DISCIPLINE REPORT

APPENDIX Q

Air Quality

February 2005



Washington State Department of Transportation

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Summary

What is air quality and why is it important?

Air quality refers to the cleanliness of the atmosphere. Pollutants in the air we breathe can have negative health effects, and cause harm to people, plants, other animals, and materials.

What studies were completed?

Air quality for the I-405 Corridor Program was evaluated in the *I-405 Corridor Program NEPA/SEPA Final EIS Air Quality Review* (WSDOT, 2001), hereafter referred to as the *programmatic EIS Air Quality Review*. The corridor-level review evaluated regional impacts of the I-405 Corridor Program, including the I-405, SR 520 to SR 522 - Kirkland Nickel Project (hereafter referred to as the Kirkland Nickel Project) area. However, it did not provide project-level analysis of local carbon monoxide (CO) impacts. During the Corridor Program analysis, the Metropolitan Transportation Plan (MTP) was refined to be consistent with the I-405 Corridor Program Selected Alternative, which was found to conform at the regional scale to the Puget Sound region's air quality maintenance plans. This report supplements the information in the *programmatic EIS Air Quality Review* and provides greater detail about the air quality, including a project-level conformity analysis.

What is the affected environment?

Worst-case carbon monoxide (CO) concentrations were evaluated at four intersections representing the highest-volume and most congested intersections that will be affected by the project. CO is analyzed because it is directly emitted from automobiles, has health consequences, and can be a surrogate for other transportation air pollutants. The maximum estimated one-hour CO concentrations from vehicle emissions for existing conditions range from 7.2 to 12.8 ppm, and the maximum estimated 8-hour CO concentrations range from 5.0 to 9.0 ppm.

Possible exceedance of the eight-hour average National Ambient Air Quality Standards (NAAQS) for CO of 9 ppm was estimated at one intersection (NE 116th Street and 124th Avenue NE) under existing conditions in 2002. The estimated exceedances of the eight-hour average NAAQS for CO under existing conditions reflect conservative modeling assumptions, including peak-period traffic conditions, worst-case meteorological conditions, high background CO concentrations, and atmospheric stability that may not persist in the study area; therefore, the exceedances may never actually occur.

What is the study area for this analysis and how was it determined?

The I-405 Corridor EIS evaluated the effects of I-405 on the air quality of the entire Puget Sound Region. This project-level analysis relies on the previous corridor analysis in discussing the regional effects, but provides detail at the local level. The study area for this analysis includes I-405, its interchanges, and adjacent intersections that would be directly affected by the project.

Would the proposed project have an impact on air quality?

No substantial air quality effects are expected as a result of the Kirkland Nickel Project.

The maximum one-hour CO concentrations from vehicle emissions with the Build Alternative were estimated to range between 5.1 and 6.8 ppm in 2014 and between 4.6 and 6.5 ppm in 2030. The maximum estimated eight-hour CO concentrations will range

between 3.6 and 4.8 ppm in 2014 and between 3.2 and 4.6 ppm in 2030. Future CO concentrations would be lower than existing concentrations because of improved emissions technology on newer vehicles. No exceedances of the NAAQS for CO are predicted for the Build Alternative. Because the project will not cause or contribute to any violation of the NAAQS for CO, it will not cause any adverse localized CO impacts.

The project is in the Puget Sound Regional Council (PSRC) Metropolitan Transportation Plan (MTP) but not yet in the Transportation Improvement Program (TIP). The project meets the local hot-spot conformity requirements. Because the project has been included in the MTP modeling, it is known to meet regional conformity technical requirements; however, it does not yet meet the procedural requirement of TIP inclusion. Once the project is included in the TIP, it will meet all requirements of 40 CFR Part 93 and WAC 173-420 and demonstrate conformity to the State Implementation Plan (SIP). WSDOT is in the process of adding the Kirkland Nickel Project to the TIP.

Would there be any construction impacts?

Construction activities typical of roadway projects will temporarily generate particulate matter and small amounts of other pollutants if not properly mitigated. Project activities to minimize the effects of construction are included in this report.

What impacts would result if the No Build Alternative were adopted?

The maximum estimated one-hour CO concentrations from vehicle emissions with the No Build Alternative were estimated to range between 5.0 and 8.0 ppm in 2014 and between 4.6 and 6.5 ppm in 2030. The maximum estimated eight-hour CO concentrations would range between 3.6 and 4.8 ppm in 2014 and between 3.5 and 5.6 ppm in 2030. No exceedances of the NAAQS for CO are predicted with the No Build Alternative.

What mitigation measures are proposed to avoid and/or minimize impacts?

None required.

Acronyms and Abbreviations Used in This Report

Acronym	Meaning
µg/m^3	micrograms per cubic meter
AQI	Air Quality Index
AQMPs	Air Quality Maintenance Plans
BMP	best management practices
BTUs	British thermal units
CO	carbon monoxide
CO_2	carbon dioxide
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
HAPs	hazardous air pollutants
HC	hydrocarbons
I&M	inspection and maintenance
IARC	International Agency for Research on Cancer
LOS	level of service
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
PAHs	polynucleated aromatic hydrocarbons
PM	particulate matter
POM	polycyclic organic matter
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
PSRC	Puget Sound Regional Council
SIP	State Implementation Plan
SO_2	sulfur dioxide
SR	State Route
TIP	Transportation Improvement Program

Acronym	Meaning
TSP	total suspended particulates
VOCs	volatile organic compounds
WSDOT	Washington State Department of Transportation

Glossary

Word	Meaning
Air Emissions	Pollutants emitted into the air, such as ozone, carbon monoxide, nitrogen oxide, nitrogen dioxide, sulfur dioxide and others.
Air Pollutant	Any substance in air that could, in high enough concentration, harm people, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or a combination thereof. Generally, they fall into two main groups: (1) those emitted directly from identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation.
Air Quality Standards	The level of pollutants prescribed by regulations that may not be exceeded during a given time in a defined area.
Attainment Area	An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.
Background Level	In air pollution control, the concentration of air pollutants in a definite area during a fixed period of time prior to the starting or stopping a source of a regulated emission. In toxic substances monitoring, the average presence in the environment, originally referred to as a naturally occurring phenomena.
Best Management Practice (BMP)	Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.
Carbon Dioxide	A colorless, odorless, gas produced by burning fossil fuels, sometimes referred to as a green house gas because it contributes to global warming.
Carbon Monoxide (CO)	A colorless, odorless, poisonous gas produced by incomplete combustion of fossil fuel.
Carboxyhemoglobin	Hemoglobin in which the iron is bound to carbon monoxide (CO) instead of oxygen.
Carcinogenic or Carcinogen	Capable of causing cancer. A suspected carcinogen is a substance that may cause cancer in humans or animals but for which the evidence is not conclusive.

Word	Meaning
Criteria Pollutants	The 1970 amendments to the Clean Air Act required the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. The EPA has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, total suspended particulates, sulfur dioxide, lead, and nitrogen oxide. The term, "criteria pollutants," derives from the requirement that the EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised.
Dispersion Model	A mathematical prediction of how pollutants from a discharge or emission source will be distributed in the surrounding environment under given conditions of wind, temperature, humidity, and other environmental factors.
Emission Factor	The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of iron ore.
Emission Standard	The maximum amount of air polluting discharge legally allowed from a single source, mobile or stationary.
Emission	Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities, vehicles, and other sources.
Enhanced Inspection and Maintenance (I&M)	An improved automobile inspection and maintenance program designed to reduce automobile emissions. The program applies to more vehicle types and model years, and requires tighter inspection, and better management practices. It may also include annual computerized or centralized inspections, under-the-hood inspection for signs of tampering with pollution control equipment, and a higher repair waiver cost.
Freeboard	The vertical distance from the material surface to the top of the side in a truck.
Fugitive Emissions	Air pollutants released to the air other than those from stacks or vents; typically small releases from leaks in plant equipment such as valves, pump seals, flanges, sampling connections, etc.

Word	Meaning
Hazardous Air Pollutants	Air pollutants which are not covered by ambient air quality standards but which, as defined in the Clean Air Act, may reasonably be expected to cause or contribute to irreversible illness or death. Such pollutants include asbestos, beryllium, mercury, benzene, coke oven emissions, radionuclides, and vinyl chloride.
Inversion	An atmospheric condition caused by the temperature increasing with elevation, resulting in a layer of warm air preventing the rise of cooler air trapped beneath it. This condition prevents the rise of pollutants that might otherwise be dispersed. Trapping pollutants near the ground can increase the concentration of ozone to harmful levels.
Level of Service (LOS)	A gauge for evaluating system performance for roadways, transit, non-motorized, and other transportation modes. For example, roadway measures of level of service often assign criteria based on volume-to-capacity ratios.
Maintenance Area	Area that has recently met the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act and being managed to continue to meet the Standards.
Mobile Model	A series of emissions models developed by EPA to estimate emissions of air pollutants from mobile sources during operation. Versions 5a and 6.2 have been used on the I-405 corridor program.
Mobile Source	Any non-stationary source of air pollution such as cars, trucks, motorcycles, buses, airplanes, and locomotives.
National Ambient Air Quality Standards (NAAQS)	Standards established by the EPA for pollutant concentrations in outside air throughout the country. (See 'criteria pollutants' and 'state implementation plans').
Nitrogen Dioxide (NO2)	The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.
Nitrogen Oxide (NOx)	Product of combustion from transportation and stationary sources and a major contributor to the formation of ozone in the troposphere and to acid deposition.
Non-Attainment Area	Area that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

Word	Meaning
Ozone (O3)	Ozone is a natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight. Ozone is a chemical oxidant and major component of photochemical smog. It can seriously impair the respiratory system and is one of the most widespread of all the criteria pollutants for which the Clean Air Act required the EPA to set standards.
Particulate	A very small solid, suspended in air or water, which can vary widely in size, shape, density, and electrical charge.
Parts per million (PPM)	Parts per million parts, a measurement of concentration on a weight or volume basis. This term is equivalent to milligrams per liter (mg/L) which is the preferred term.
Persistence	Refers to the length of time a compound stays in the environment, once introduced. A compound may persist for less than a second or it may persist indefinitely.
Photochemical Oxidants	Air pollutants formed by the action of sunlight on oxides of nitrogen and hydrocarbons.
PM2.5	Particulate matter less than 2.5 micrometers in diameter.
PM10	A standard for measuring the amount of solid or liquid matter suspended in the atmosphere, i.e. the amount of particulate matter less than 10 micrometers in diameter; smaller PM10 particles penetrate to the deeper portions of the lung, affecting sensitive population groups such as individuals with respiratory ailments and children.
Precursor	In photochemistry, a compound antecedent to a volatile organic compound (VOC). Precursors react in sunlight to form ozone or other photochemical oxidants.
Smog	Dust, smoke, or chemical fumes that pollute the air and make hazy, unhealthy conditions. Automobile, truck, bus, and other vehicle exhausts and particulates are usually trapped close to the ground, obscuring visibility and contributing to a number of respiratory problems.
State Implementation Plans	Plans required by the federal Clean Air Act to provide an outline of how nonattainment and maintenance areas will meet the National Ambient Air Quality Standards (NAAQS).

Word	Meaning
Troposphere	Found in two layers of the atmosphere, the stratosphere and the troposphere. The troposphere starts at the earth's surface and extends 5 to 9 miles high. The stratosphere starts just above the troposphere and extends to 31 miles. This is the part of the atmosphere that contains the ozone layer.
Volatile Organic Compounds (VOC):	Any organic compound which evaporates readily to the atmosphere. VOCs contribute significantly to photochemical smog production and certain health problems.

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1.0 Introduction

This report describes the potential air quality changes associated with the construction and operation of widening Interstate 405 (I-405) from the vicinity of the I-405/SR 520 interchange north to the south side of the I-405/SR 522 interchange. This report provides background on the project, discusses transportation air quality in general, assesses the potential of each alternative for changes in air quality, and discusses appropriate avoidance measures.

Air quality for the I-405 Corridor Program was evaluated in the *programmatic EIS Air Quality Review* (WSDOT, 2001), which is incorporated by reference in this report. The corridor-level review evaluated regional impacts of the I-405 Corridor Program, including the Kirkland Nickel Project area, but did not provide project-level analysis of local carbon monoxide (CO) impacts. During the Corridor Program analysis, the Metropolitan Transportation Plan (MTP) was refined to be consistent with the I-405 Corridor Program Selected Alternative, and the Selected Alternative was found to conform at the regional scale to the Puget Sound region's air quality maintenance plans. This report supplements the information in the *programmatic EIS Air Quality Review* and provides increased detail about the air quality, including a project-level conformity analysis.

1.1 Background

Air quality in the project area is regulated by the US Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and Puget Sound Clean Air Agency (PSCAA). Under the Clean Air Act, the EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide. The standards applicable to transportation projects are summarized in Table 1-1. The eight-hour ozone and $PM_{2.5}$ standards have been upheld by the Supreme Court, but have not yet been implemented by the EPA. The eight-hour CO standard of 9 parts per million (ppm) is the standard most likely to be exceeded as a result of transportation projects. Federal funding may be jeopardized for transportation projects that do not conform to the NAAQS.

Nonattainment areas are geographical regions where air pollutant concentrations exceed the NAAQS for a pollutant. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS. The I-405 corridor lies within ozone and CO maintenance areas. Air quality emissions in the Puget Sound region are currently being managed under the provisions of Air Quality Maintenance Plans (AQMP) for Ozone and CO. The current plans were developed by PSCAA and Ecology and approved by the EPA in 1996. Any regionally significant transportation project in the Puget Sound Air Quality Maintenance areas must conform to the AQMPs. Conformity is demonstrated by showing that the project would not cause or contribute to any new violation of any NAAQS, not increase the frequency or severity of any existing violation of any NAAQS, or not delay timely attainment of the NAAQS.

The characteristics and health effects of pollutants associated with transportation projects were discussed in the *programmatic EIS Air Quality Review*.

Table 1-1: Summary of Ambient Air Quality Standards

Pollutant	National Primary Standard	Washington State & PSCAA Regional Standards
CARBON MONOXIDE (CO)		
One-hour average (not to be exceeded more than once per year)	35 ppm	35 ppm
Eight-hour average (not to be exceeded more than once per year)	9 ppm	9 ppm
PM_{10}		
Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3
24-hour average concentration (not to be exceeded more than once per year)	150 µg/m^3	150 µg/m^3
$PM_{2.5}$		
Annual Arithmetic Mean	15 µg/m^3	NS
24-hour average concentration (not to be exceeded more than once per year)	65 µg/m^3	NS
TOTAL SUSPENDED PARTICULATES (TSP)		
Annual Arithmetic Mean	NS	60 µg/m^3
24-hour average concentration (not to be exceeded more than once per year)	NS	150 µg/m^3
OZONE		
One-hour average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm
Eight-hour average (not to be exceeded more than once per year)	0.08 ppm	NS
NS = No Standard		

1.2 Weather

Weather directly influences air quality. Important meteorological factors include wind speed and direction, atmospheric stability, temperature, sunlight intensity, and mixing depth. Temperature inversions, which are associated with higher air pollution concentrations, occur when warmer air overlies cooler air. During temperature inversions in late fall and winter, particulates and CO from wood stoves and vehicle sources can be trapped close to the ground, which can lead to violations of the NAAQS. In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions followed by intense sunlight and high temperatures.

1.3 Carbon Monoxide

CO is a colorless, odorless, and poisonous gas that reduces the oxygen-carrying capability of the blood by bonding with hemoglobin, forming carboxyhemoglobin, which prevents oxygenation of the blood. An exposure to CO concentrations of 80 ppm over eight hours results in a carboxyhemoglobin level of approximately 15 percent (Erlich, 1977). Acute health effects, such as headaches, slowed reflexes, weakened judgment,

and impaired perception begin at about 3 percent carboxyhemoglobin (carbon monoxide bonding with 3 percent of the hemoglobin). Chronic effects include aggravation of pre-existing cardiovascular disease and increased heart disease risk in healthy individuals. At carboxyhemoglobin levels of approximately 30 percent, individuals become nauseous and collapse and at very high levels (above 50 percent carboxyhemoglobin) individuals die.

The major source of CO is vehicular traffic, along with industry, wood stoves, and slash burns. In urban areas, motor vehicles are often the source of more than 90 percent of the CO emissions that cause ambient levels to exceed the NAAQS (EPA, 1992).

Areas of high CO concentrations usually are localized, occurring near congested roadways and intersections during autumn and winter, and are associated with light winds and stable atmospheric conditions. These localized areas of elevated CO levels are referred to as CO hot spots. Diminishing CO concentrations in most areas have resulted from more stringent federal emission standards for new vehicles and the gradual replacement of older, more polluting vehicles. CO levels have been declining in urban areas, but are leveling off or increasing in areas with rapid growth in traffic volumes, including the more distant suburbs of the Puget Sound region.

1.4 Particulate Matter

Particulate matter includes small particles of dust, soot, and organic matter suspended in the atmosphere. Particulates less than 100 micrometers in diameter are measured as Total Suspended Particulates (TSP). Particles less than 10 micrometers in size are measured as PM_{10}, a component of TSP. Particles less than 2.5 micrometers in size are measured as $PM_{2.5}$, a component of PM_{10} and TSP. The smaller $PM_{2.5}$ and PM_{10} particles can be inhaled deeply into the lungs, potentially leading to respiratory diseases and cancer. Particulate matter may carry absorbed toxic substances, and the particle itself may be inherently toxic. Particulate matter can affect visibility, plant growth, and it can disintegrate building materials. Sources of particulates include motor vehicles, industrial boilers, wood stoves, open burning, and dust from roads, quarries, and construction activities.

Most vehicular emissions are in the $PM_{2.5}$ size range, while road and construction dust is often in the larger PM_{10} range. Most vehicle fine particulate emissions result from diesel vehicles, which release fine particulates both directly, mostly as carbon compounds, and indirectly in the form of sulfur dioxide (SO_2), a gas that reacts in the atmosphere to form sulfate particulates. High $PM_{2.5}$ and PM_{10} concentrations occur in fall and winter during periods of air stagnation and high use of wood for heat.

In the Puget Sound region, fireplaces and woodstoves account for almost two-thirds of winter $PM_{2.5}$ emissions (PSCAA, 1999). On-road vehicle emissions contribute approximately 12 percent of the region's $PM_{2.5}$ emissions, while construction and other dust sources contribute approximately 6 percent. The EPA $PM_{2.5}$ standard, shown Table 1-1, was recently upheld by the Supreme Court, but has not yet been implemented by the EPA.

Particulates emitted from diesel vehicles pose specific health risks when compared to other types of particulate matter. The EPA Clean Air Scientific Advisory Committee is currently reviewing recent health assessment data on diesel emissions, which is not yet available for citation. Previous EPA research (EPA, 1993) found that components of diesel particulates, primarily high-molecular-weight organic compounds, have several negative health effects, including carcinogenesis, accumulation of particles in the lungs,

tissue inflammation, respiratory irritation, and other related effects. Health effects associated with diesel particulates were among the major contributing factors leading to establishing the new $PM_{2.5}$ standard.

1.5 Ozone

Ozone is a highly toxic form of oxygen and is a major component of the complex chemical mixture that forms photochemical smog. Ozone is not produced directly, but is formed by a reaction between sunlight, nitrogen oxides (NO_x), and hydrocarbons (HC). Ozone primarily is a product of regional vehicular traffic, point source industrial emissions, and fugitive emissions of the ozone precursors. Tropospheric (ground-level) ozone, which results from ground-level precursor emissions, is a health-risk, while stratospheric (upper-atmosphere) ozone, which is produced through a different set of chemical reactions that only require oxygen and intense sunlight, protects people from harmful solar radiation. In the remainder of this report, the term ozone refers to the harmful tropospheric ozone.

Ozone irritates the eyes and respiratory tract and increases the risk of respiratory and heart diseases. Ozone reduces the lung function of healthy people during exercise, can cause breathing difficulty in susceptible populations, such as asthmatics and the elderly, and damages crops, trees, paint, fabric, and synthetic rubber products. The severity of the health effects depends on both dose and exposure-duration (National Research Council, 1992). The EPA has adopted a new eight-hour ozone standard, as shown in Table 1-1; however, the old one-hour standard is still applicable for current non-attainment and maintenance areas. The eight-hour standard was recently upheld by the Supreme Court, but has not yet been implemented by EPA.

In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions followed by intense sunlight and high temperatures. Maximum ozone levels generally occur between noon and early evening at locations several miles downwind from the sources, after NO_x and HC have had time to mix and react under sunlight. Light, northeasterly winds arising during these conditions result in high ozone concentrations near the Cascade foothills to the south and southeast of major cities. Ozone precursor emissions in the I-405 corridor create ozone towards Lake Sammamish and the Cascade foothills.

1.6 Hazardous Air Pollutants

Other chemicals or classes of chemicals in motor vehicle emissions that are considered hazardous by EPA include benzene, formaldehyde, 1, 3-butadiene, acetaldehyde and gasoline vapors (EPA, 1993). Benzene emissions in the Puget Sound region are substantially higher than the national average. The emissions of these compounds are much lower than the emissions of the pollutants evaluated in this study, and would be different for each of the alternatives in a fashion similar to the pollutants presented in this report.

1.7 Greenhouse Gases

Automobiles also emit greenhouse gases, primarily carbon dioxide (CO_2). CO_2 emissions are proportional to fuel consumption. Passenger cars emit an average of 225 grams of CO_2 per kilometer traveled (0.8 pounds per mile) and sport-utility vehicles and light trucks emit about 50 percent more CO_2 per mile. Because CO_2 emissions are directly proportional to fuel consumption, they vary with speed and are the lowest at a speed of approximately 45 mph, where most automobiles are most fuel-efficient.

Because the emissions pattern relative to vehicle speed is similar to that of CO, CO_2 emissions would be different for each of the alternatives in a pattern similar to CO emissions, but the emissions would be an order of magnitude greater than the emissions of CO.

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2.0 Project Description

2.1 I-405 Corridor Program

Responding to the transportation crisis within the I-405 Corridor, which extends 30 miles from the I-5 interchange in the City of Tukwila northward to I-5 in Lynnwood, the Washington State Department of Transportation (WSDOT) brought together every city, transportation, and regulatory agency having jurisdiction within those boundaries to help formulate the I-405 Corridor Program. The program's goal—to create a comprehensive strategy to reduce congestion and improve mobility along I-405 by providing an efficient and integrated system for all transportation users (cars, transit, freight, carpools, vanpools, bicyclists, and pedestrians) while protecting the environment.

The *I-405 Corridor Program NEPA/SEPA Final Environmental Impact Statement* (EIS), completed in 2002, provided a corridor-wide environmental review and Record of Decision (ROD), issued in October 2002, for the vision, and for improvements to I-405 between I-5 in Tukwila and I-5 in Lynnwood. In general, the Selected Alternative identified in the ROD provides for widening I-405 by up to two lanes, plus auxiliary lanes in each direction, throughout its 30-mile length. The freeway design includes a buffer separating the general-purpose (general-purpose) lanes and the high-occupancy vehicle (HOV) lane, and it provides for operation of a bus rapid transit system in the improved HOV lanes.

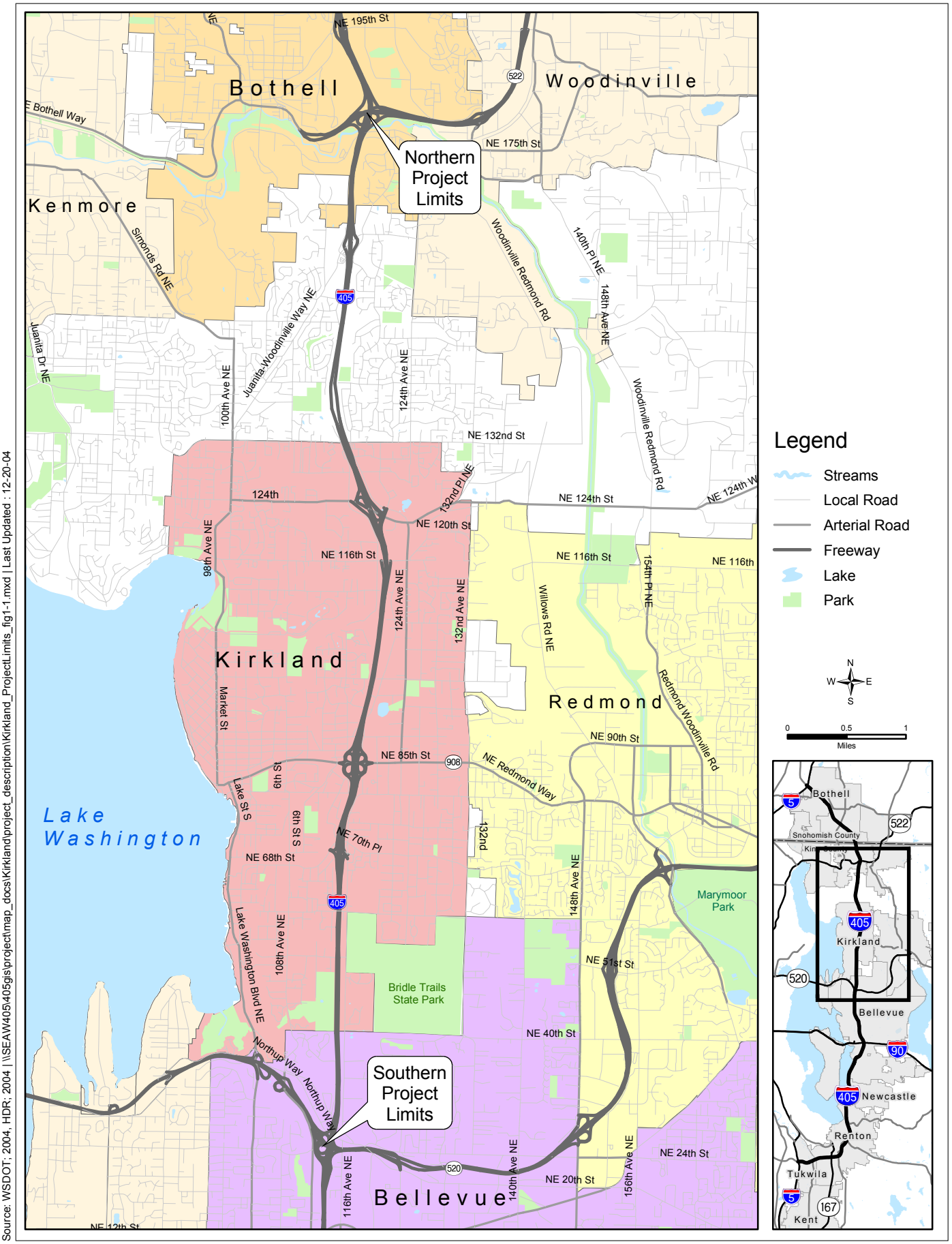
The EIS and ROD specified that improvements contained within the Selected Alternative be re-examined individually or in combination for phased implementation. The Kirkland Nickel Project is one of several projects being advanced as part of a phased implementation of the Selected Alternative. In keeping with the direction established in the EIS and the ROD, the Kirkland Nickel Project is proposed for evaluation within a National Environmental Policy Act (NEPA) Environmental Assessment (EA) that focuses on the project-level effects of the proposed improvements.

2.2 Kirkland Nickel Project

The environmental review for the Kirkland Nickel Project incorporates, by reference, the I-405 Corridor Program EIS and analyzes the project-specific effects on the environment that were not considered in the EIS. Project-specific-level environmental review need not re-examine corridor-level alternatives, effects, and measures to minimize effects that were evaluated in the EIS, nor reconsider decisions made in the ROD.

The Kirkland Nickel Project improvement area encompasses approximately 7.6 miles from the north side of the I-405 and SR 520 interchange and extends northward to the south side of the I-405 and SR 522 interchange (Figure 1). Principal features of the Build Alternative for the Kirkland Nickel Project are:

- A northbound general-purpose lane will be constructed from the I-405 and NE 70th Street interchange to the I-405 and NE 124th Street interchange;



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Kirkland Nickel Project Vicinity

FIGURE 1

- A southbound general-purpose lane will be constructed from the I-405 and SR 522 interchange to the I-405 and SR 520 interchange;

- I-405 at the NE 116th Street interchange will be reconstructed, realigned, and reconfigured;

Other features of the project include:

- Interchange improvements will be made to NE 85th Street and NE 116th Street;

- Stormwater management facilities will be constructed to provide water quality treatment and detention and conveyance system upgrades;

- Context Sensitive Solutions (CSS) will be implemented during the project to incorporate the elements of mobility, safety, environment, and aesthetics throughout the project; and

- Measures will be implemented that will avoid or minimize impacts or compensate for unavoidable effects to the environment.

2.2.1 Transit and HOV System Improvements

A Park and Ride lot with approximately 18 parking stalls would be displaced by the widening of NE 116th Street. The lot is located on the north side of 116th Street, west of I-405.

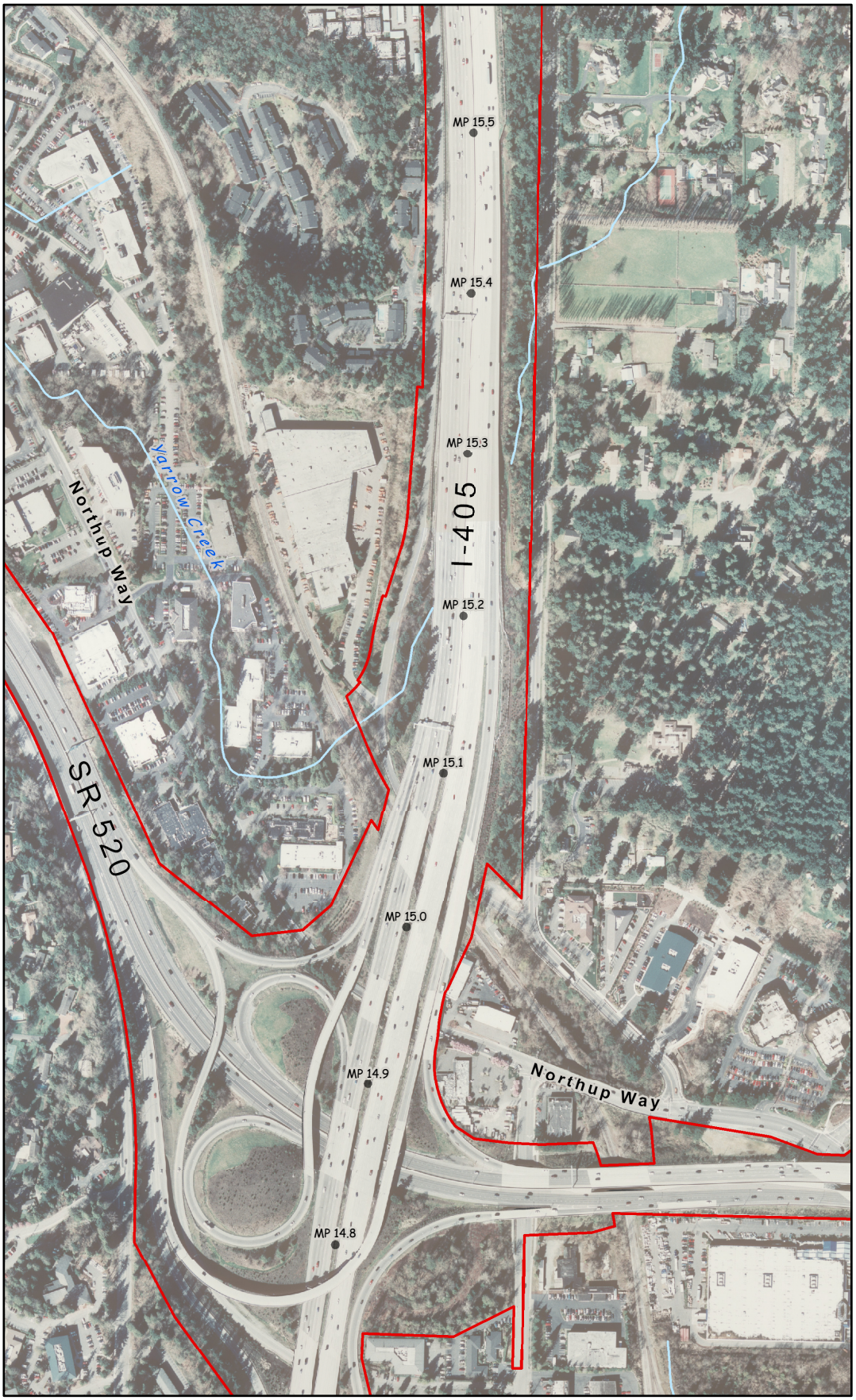
2.2.2 Roadway Improvements

The major thrust of the Kirkland Nickel Project is to increase highway capacity by adding general-purpose lanes to I-405 and making operational improvements at a number of locations. Figure 2 (Sheets 1 through 11) shows the major features of the proposed project. Figure 3 shows existing and proposed lane configurations.

Lane improvements

One way to visualize the changes proposed to the mainline is to imagine you are driving along I-405, beginning in Bellevue heading north toward Bothell, and then returning to Bellevue. The following description of roadway improvements follows this route and identifies the changes proposed at freeway interchanges as part of the Kirkland Nickel Project:

- **Northbound, North of SR 520 Interchange to NE 70th Street:** No changes are proposed for this section of roadway. This roadway will continue to have four general-purpose lanes and one HOV lane.



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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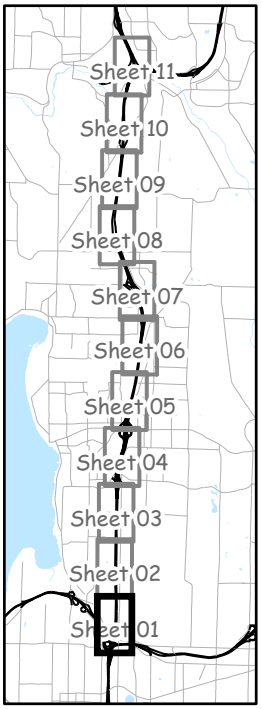
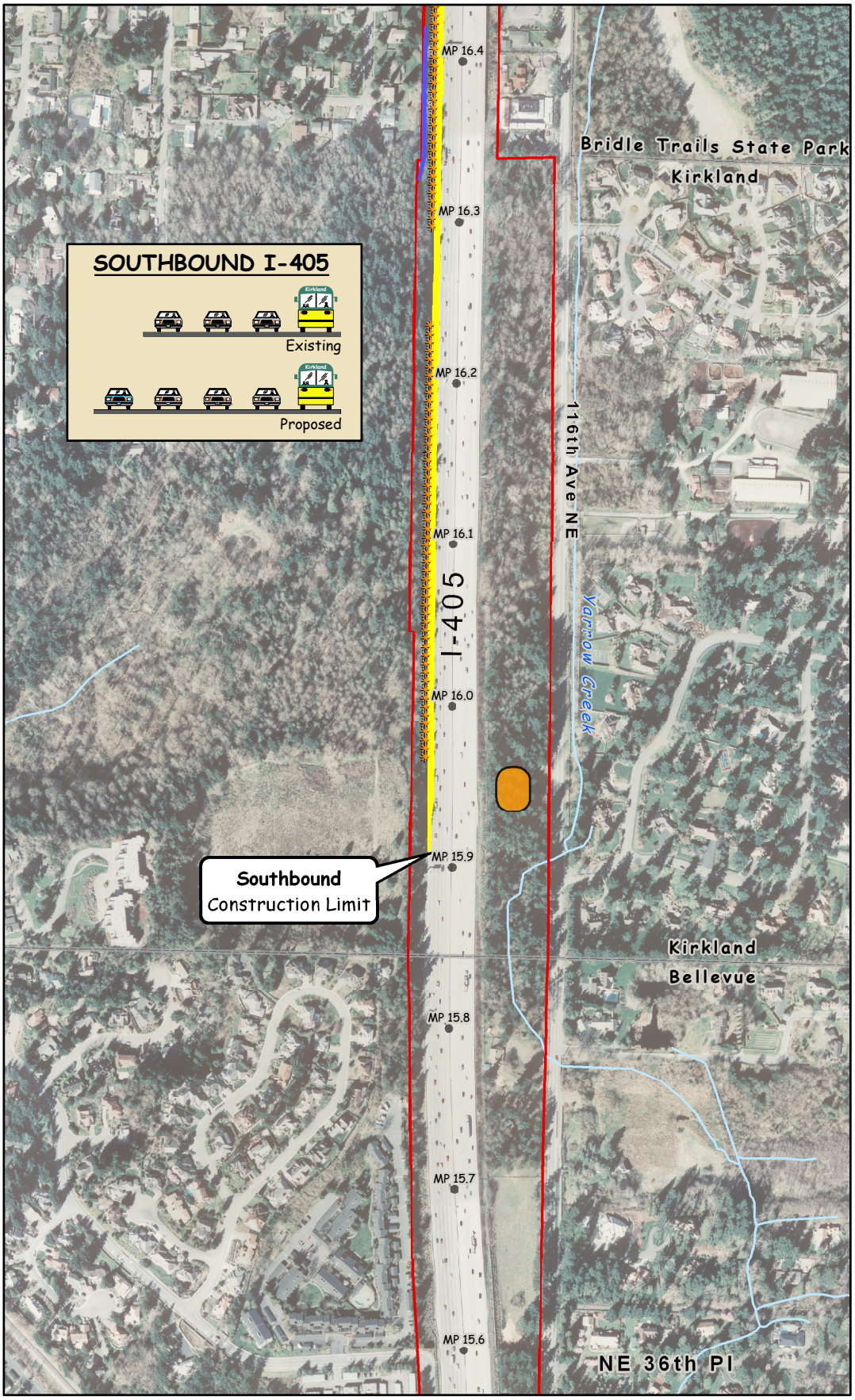


Kirkland Nickel Proposed Improvements

Southbound Improvements	**Northbound Improvements**	**Figure 2**
No changes are proposed for this section of freeway.	No changes are proposed for this section of freeway.	Sheet 1 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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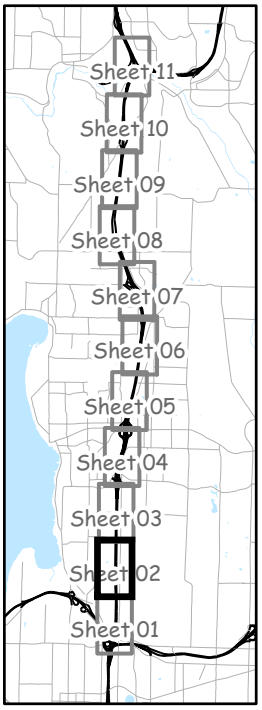


Kirkland Nickel Proposed Improvements

Southbound Improvements

A new lane will be added by widening the existing pavement up to 15 feet to the outside (west). The new lane will tie into the existing add lane for the connection to the SR-520 interchange, which is located approximately 330 feet north of the Bellevue city boundary (milepost 15.83).

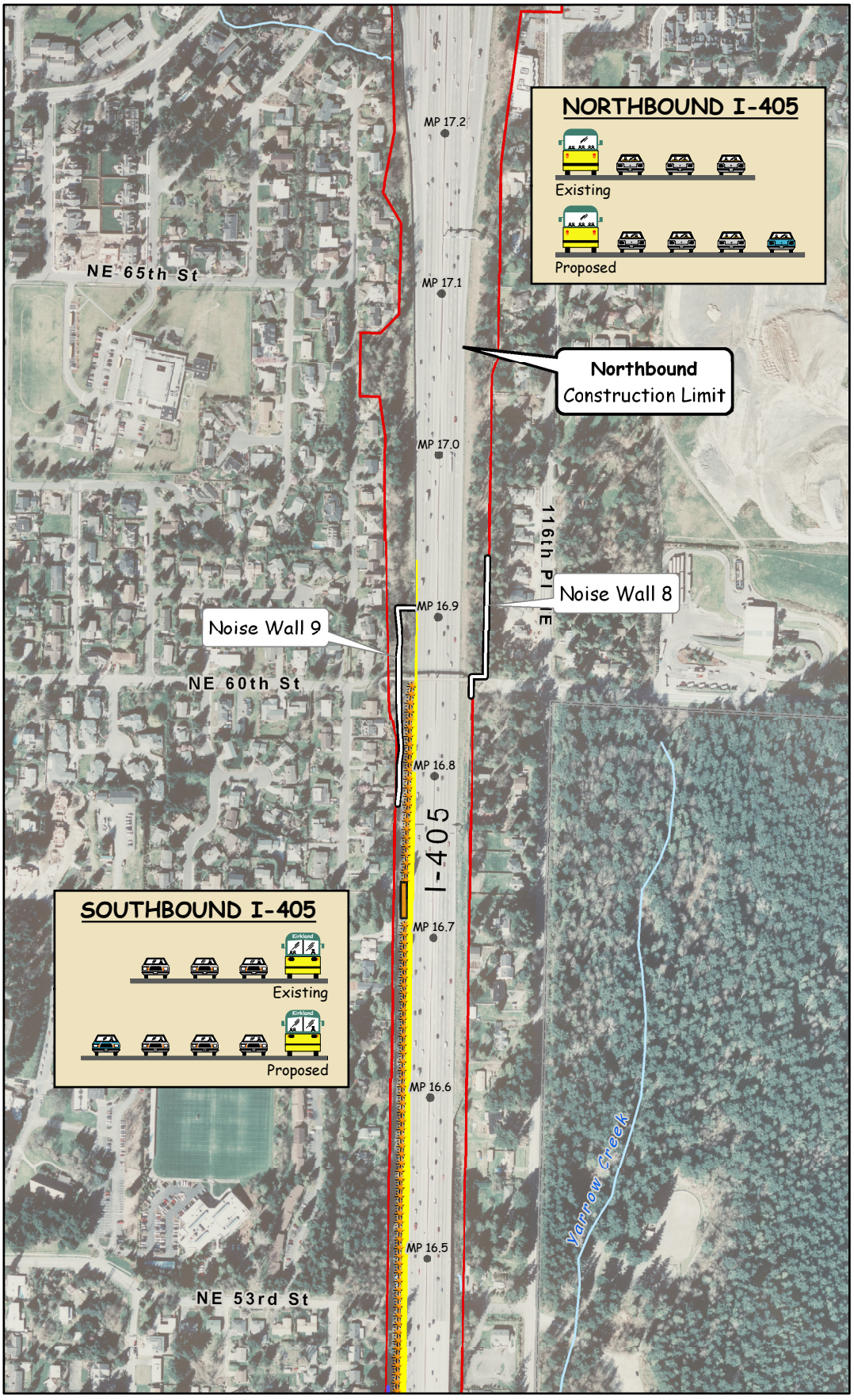
Northbound Improvements

No changes are proposed for this section of freeway.

Figure 2

Sheet 2 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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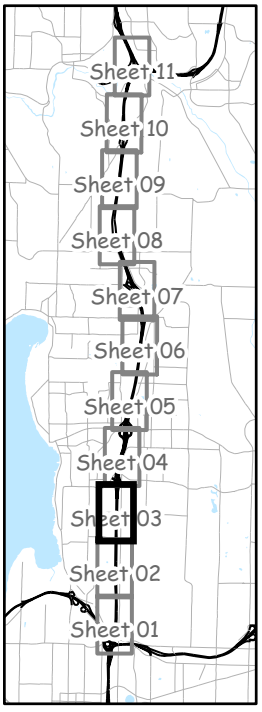


Kirkland Nickel Proposed Improvements

Southbound Improvements

A new lane will be added by widening the existing pavement up to 15 feet to the outside (west). The new lane will continue by restriping the existing pavement.

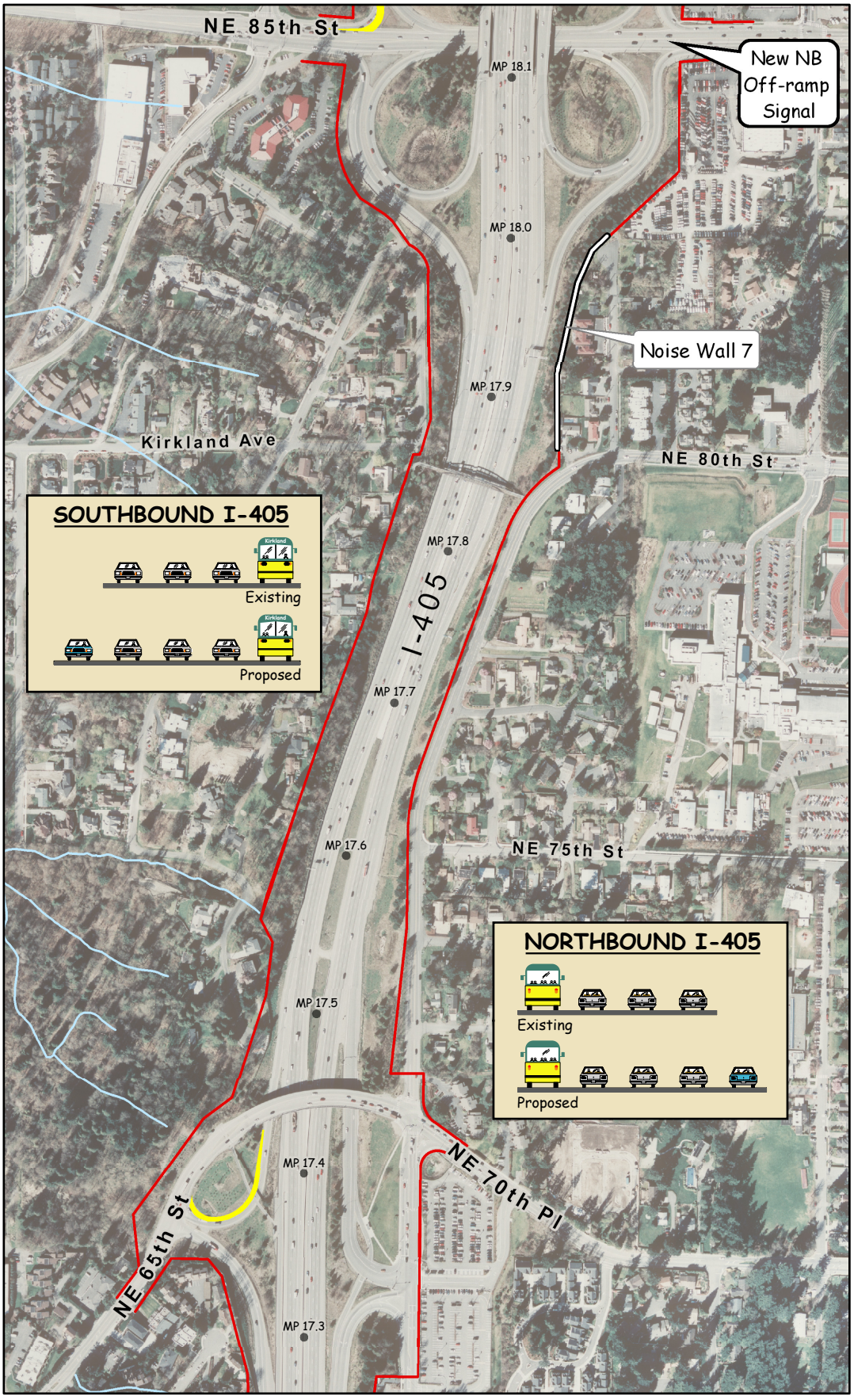
Northbound Improvements

The existing drop lane (exit only) at the NE 70th street off-ramp will become a through lane. The new lane will continue by restriping the existing pavement.

Figure 2

Sheet 3 of 11

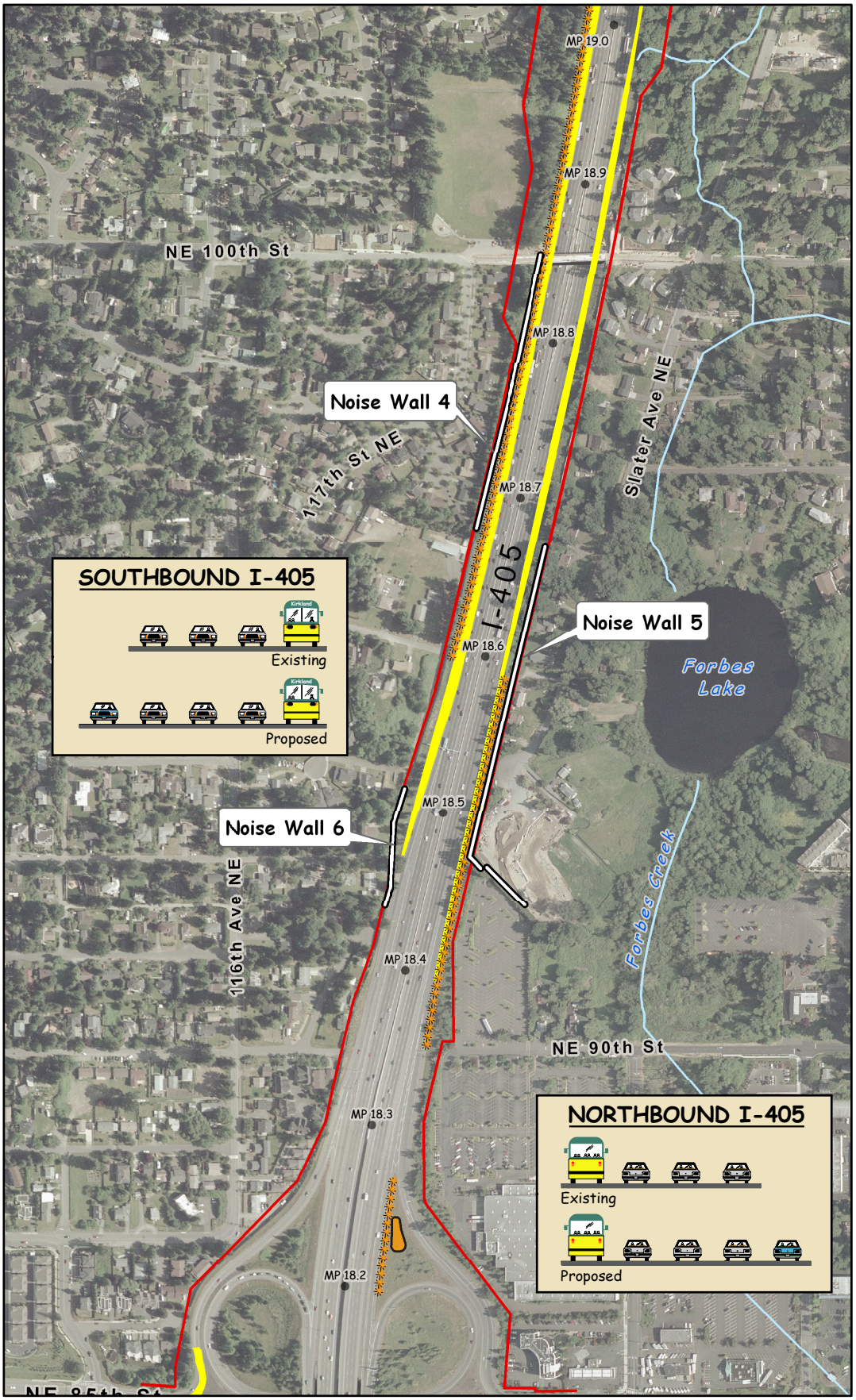
Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Kirkland Nickel Proposed Improvements

Southbound Improvements	Northbound Improvements	Figure 2
A new lane will be added by restriping in this area.	The new lane will be added by restriping in this area. The pavement may be widened to the outside (east) in select areas to provide space for emergency pullout areas.	Sheet 4 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
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- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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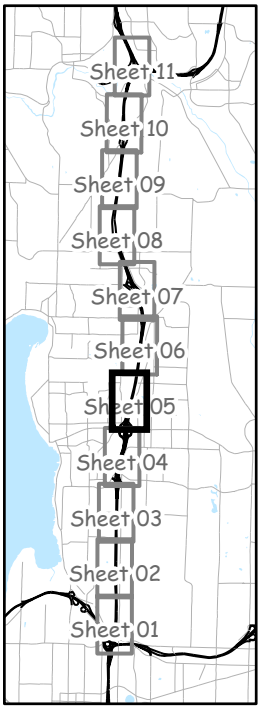


Kirkland Nickel Proposed Improvements

Southbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (west).

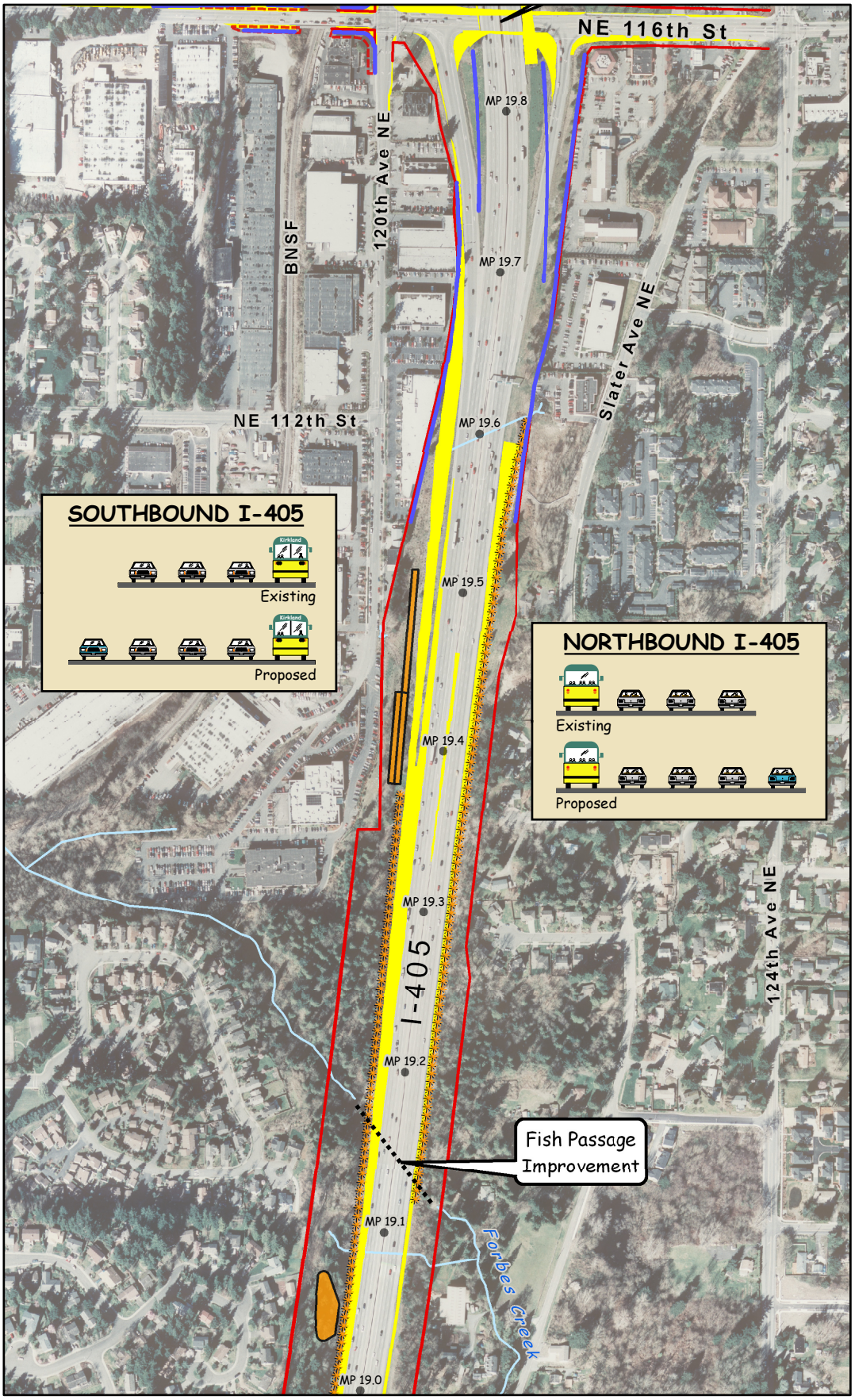
Northbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (east) beginning at the on-ramp from NE 85th Street.

Figure 2

Sheet 5 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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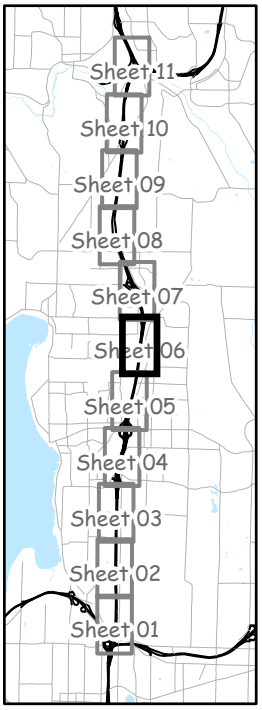


Kirkland Nickel Proposed Improvements

Southbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (west).

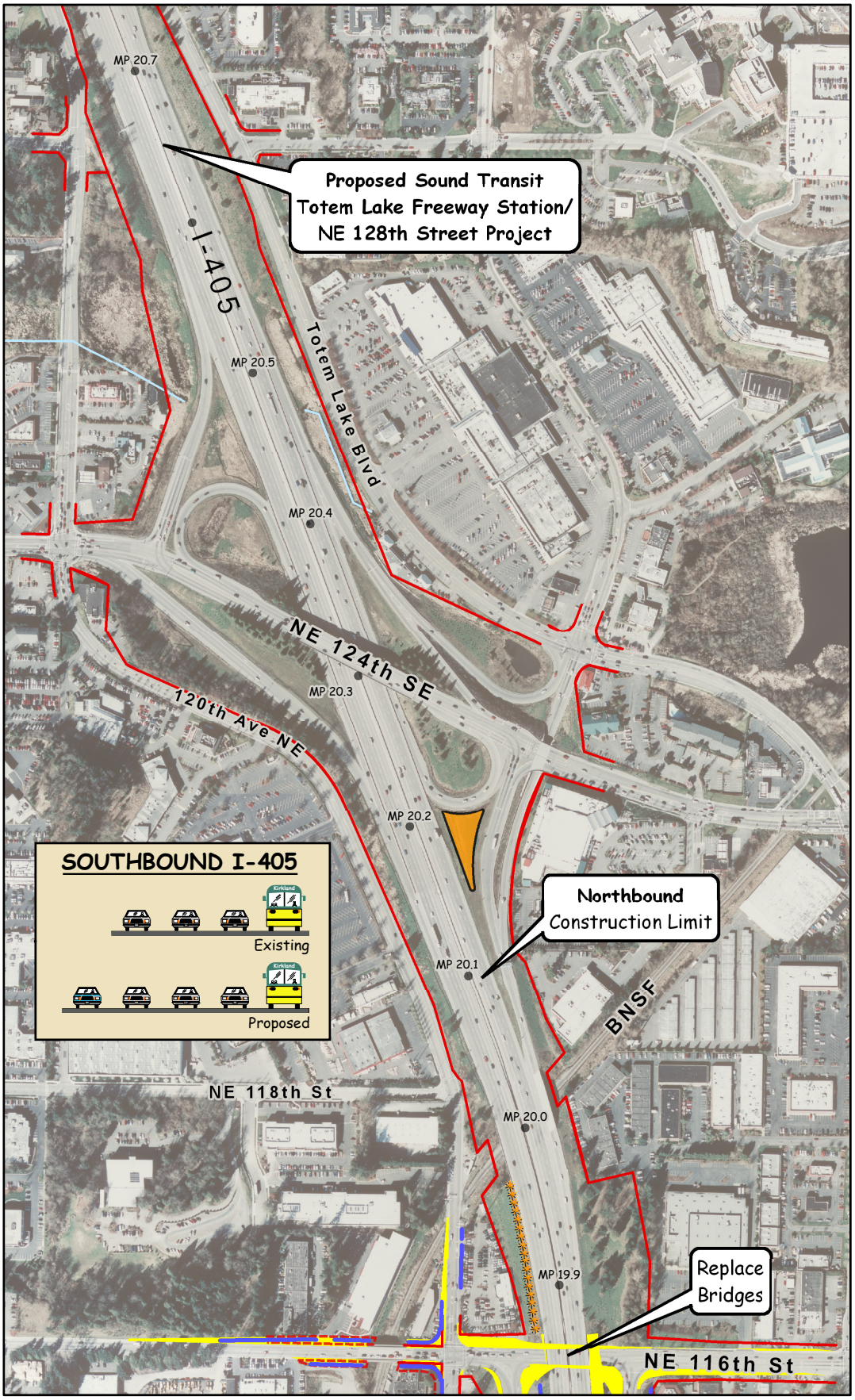
Northbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (east).

Figure 2

Sheet 6 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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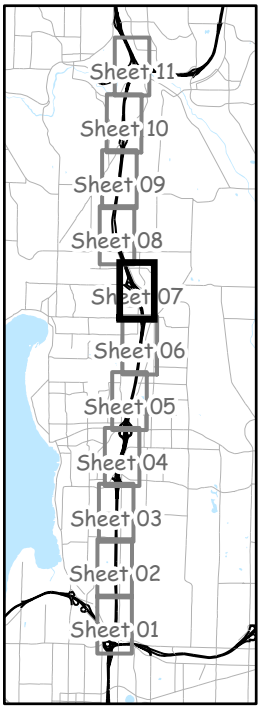


Kirkland Nickel Proposed Improvements

Southbound Improvements

The new lane will be added by restriping in this area. The project will tie into the proposed Sound Transit NE 128th Street HOV Direct Access Project.

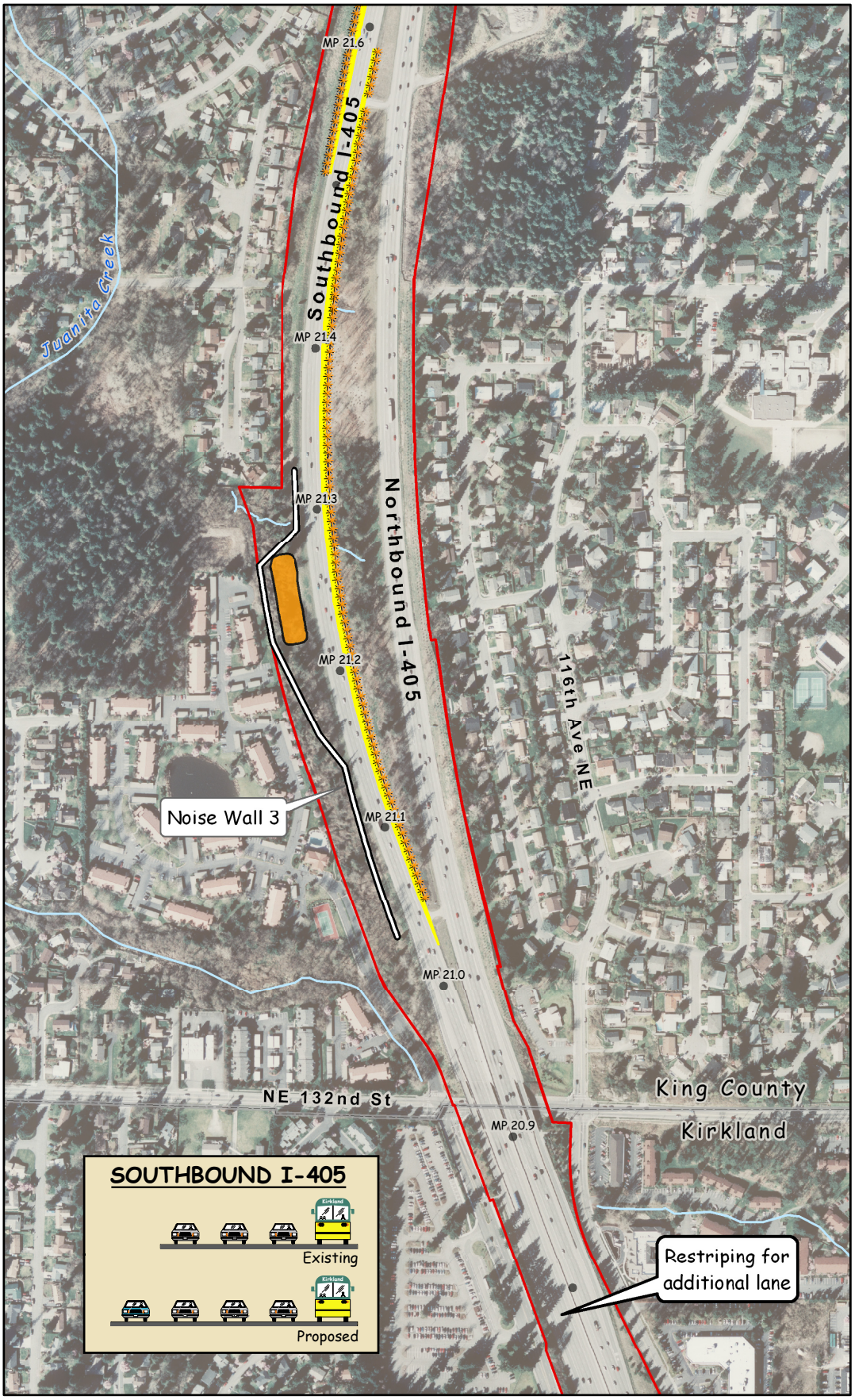
Northbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (east). The new general-purpose lane will become a drop lane (exit only) at NE 124th Street.

Figure 2

Sheet 7 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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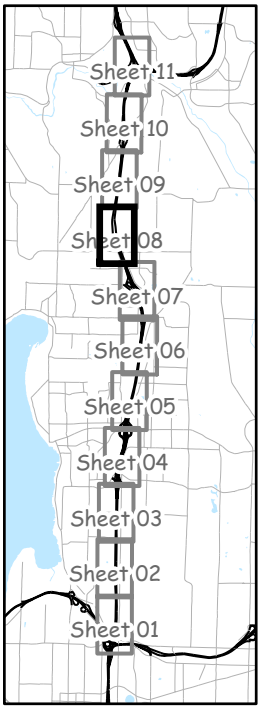


Kirkland Nickel Proposed Improvements

Southbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the inside (east) from 132nd Street to milepost 21.5 and to the outside (west) up to NE 160th Street Interchange.

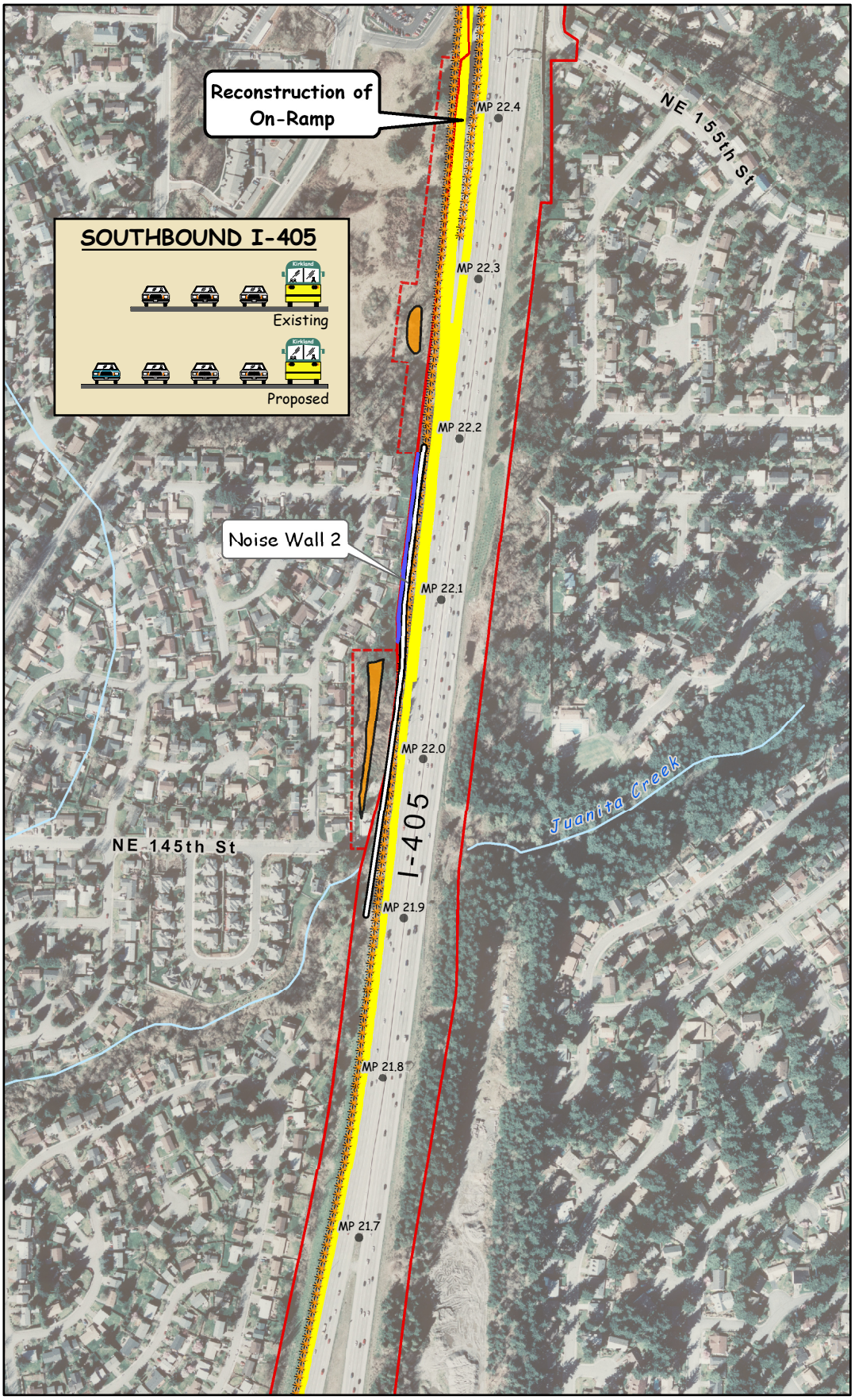
Northbound Improvements

No changes are proposed for this section of freeway.

Figure 2

Sheet 8 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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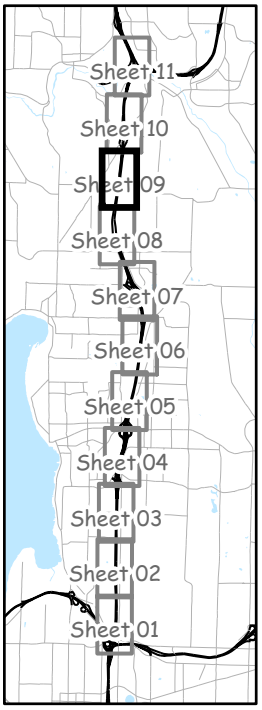


Kirkland Nickel Proposed Improvements

Southbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (west) up to NE 160th Street Interchange.

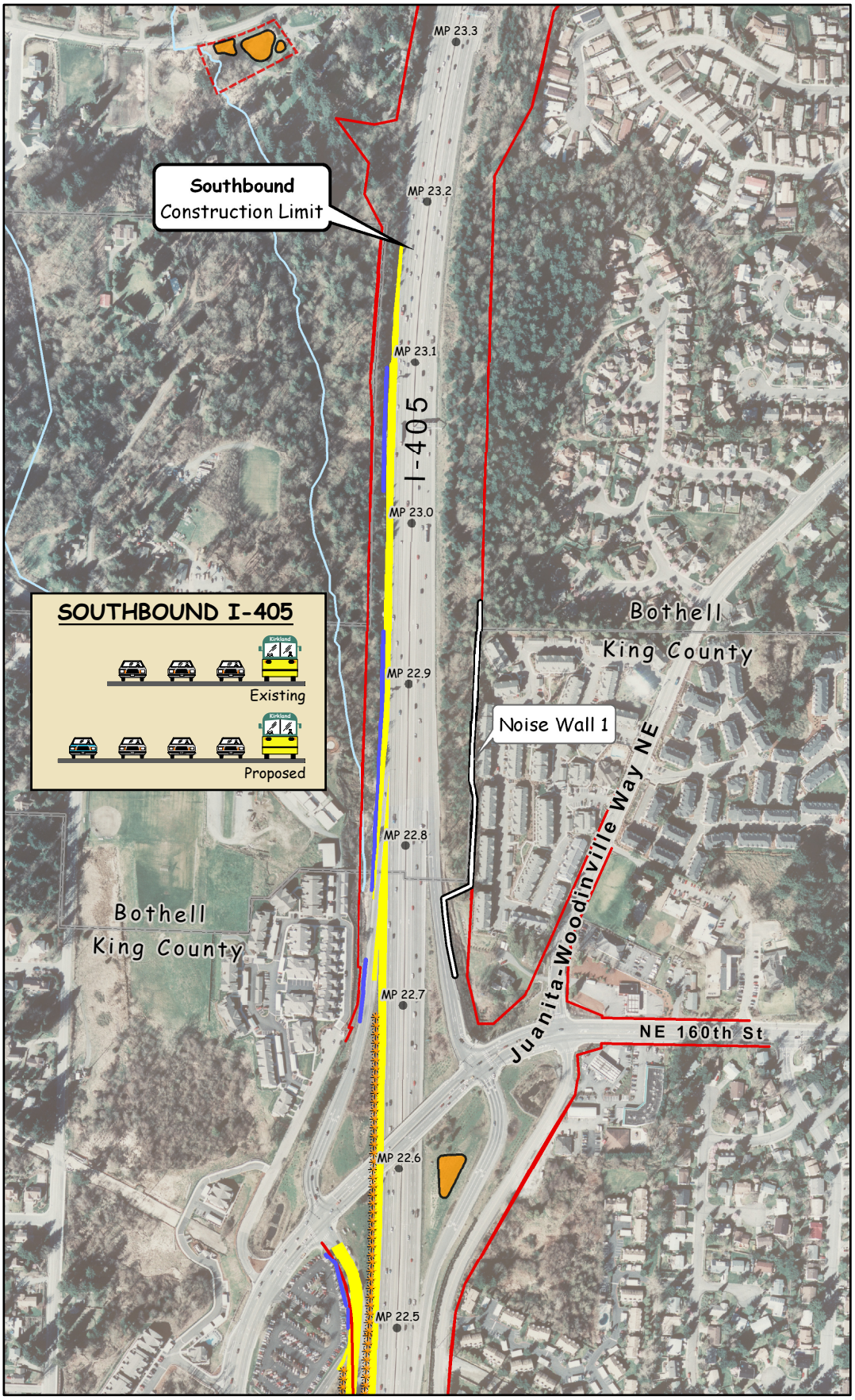
Northbound Improvements

No changes are proposed for this section of freeway.

Figure 2

Sheet 9 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05



Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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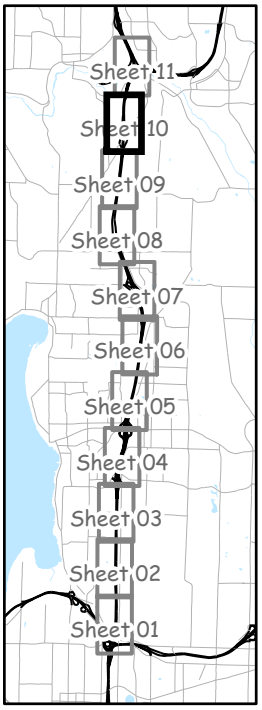

Kirkland Nickel Proposed Improvements

Southbound Improvements

The new lane will be added by widening the existing pavement up to 15 feet to the outside (west). The additional lane will connect to the existing merge lane from the eastbound SR-522 connector (to southbound I-405).

Northbound Improvements

No changes are proposed for this section of freeway.

Figure 2

Sheet 10 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05

Legend

- Streams
- Proposed ROW
- Existing ROW
- Proposed Retaining Wall
- Noise Wall
- Proposed Ecology Emabankment
- Proposed Detention Pond or Vault
- New Pavement
- Municipality

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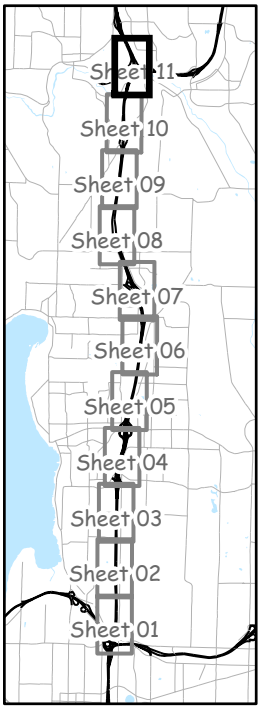


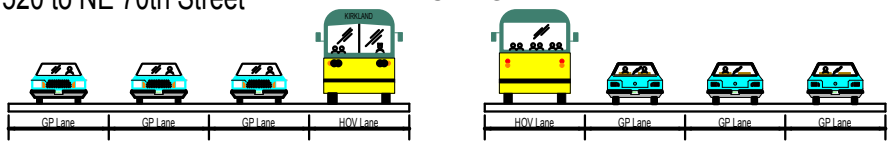
Kirkland Nickel Proposed Improvements

Southbound Improvements	Northbound Improvements	
No changes are proposed for this section of freeway.	No changes are proposed for this section of freeway.	**Figure 2** Sheet 11 of 11

Source: WSDOT; 2004, King County; 2004 | \\SEAW405405GIS\project\map_docs\EA\Project_Description.mxd | Last Updated : 02-07-05

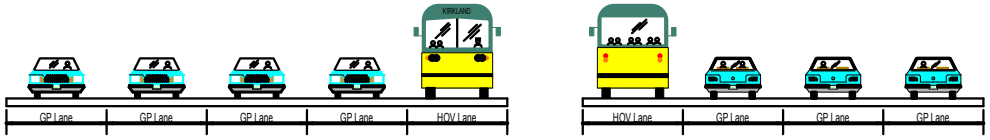
I-405 - North of SR 520 to NE 70th Street

EXISTING



SOUTHBOUND NORTHBOUND

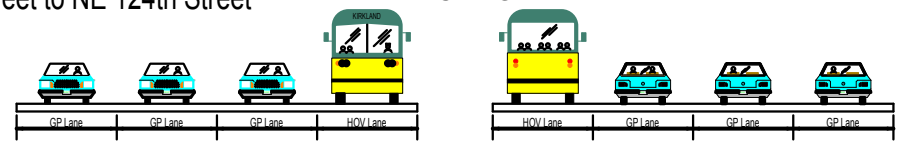
PROPOSED



SOUTHBOUND NORTHBOUND

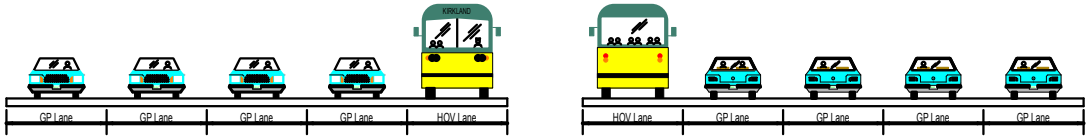
I-405 - NE 70th Street to NE 124th Street

EXISTING



SOUTHBOUND NORTHBOUND

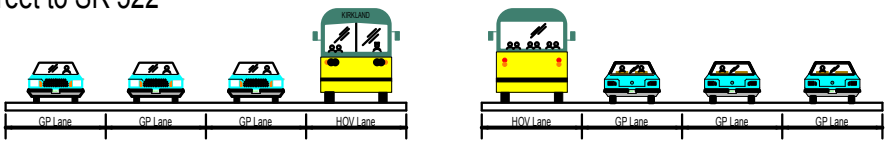
PROPOSED



SOUTHBOUND NORTHBOUND

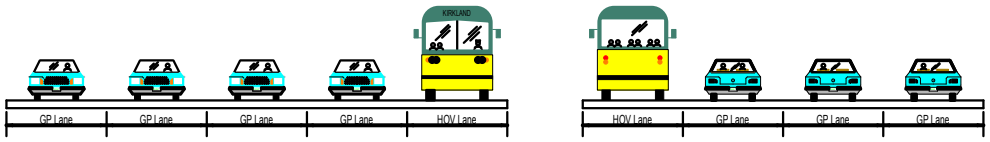
I-405 - NE 124th Street to SR 522

EXISTING



SOUTHBOUND NORTHBOUND

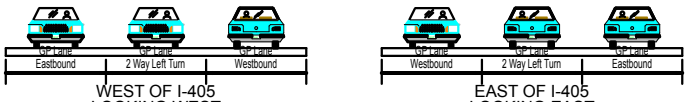
PROPOSED



SOUTHBOUND NORTHBOUND

NE 116th Street

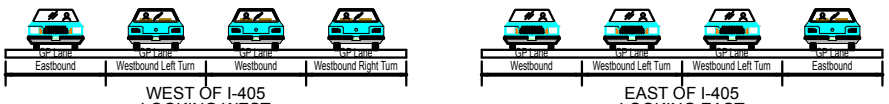
EXISTING



WEST OF I-405 LOOKING WEST

EAST OF I-405 LOOKING EAST

PROPOSED



WEST OF I-405 LOOKING WEST

EAST OF I-405 LOOKING EAST

HOV = High Occupancy Vehicle
GP = General Purpose

NOT TO SCALE

Kirkland Nickel Project Proposed Improvements - Typical Roadway Sections

Figure 3

- **Northbound, NE 70th Street to NE 85th Street:** WSDOT proposes one additional general-purpose lane for a total of four general-purpose lanes and one HOV lane. The existing drop lane (exit only) to the NE 70th Street off-ramp will become a through lane. The existing bridges over NE 85th Street will remain unchanged. Restriping over these bridges will accommodate the additional lane, resulting in narrower lanes and shoulders. The pavement will be widened to the outside (east) in select areas to provide space for emergency pullout areas.

- **Northbound, NE 85th Street to NE 116th Street:** WSDOT proposes one additional general-purpose lane for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet to the outside (east) beginning at the on-ramp from NE 85th Street. Approaching NE 116th Street, the alignment is shifted by approximately 20 feet to the east to accommodate the bridge reconstruction phasing at the northbound I-405 bridge over NE 116th Street. (For improvements to the 116th interchange, see Interchanges below).

- **Northbound, NE 116th Street to NE 124th Street:** WSDOT will continue the new general-purpose lane added from the south for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by up to 15 feet to the outside (east) to accommodate the new lane. The new general-purpose lane will become a drop lane (exit only) at NE 124th Street.

- **Northbound, NE 124th Street to SR 522:** North of the NE 124th Street off-ramp, WSDOT does not propose any changes to the roadway; it will remain as three general-purpose lanes and one HOV lane.

- **Southbound, SR 522 to NE 160th Street:** WSDOT proposes one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The additional lane will connect to the existing merge lane from the eastbound SR 522 connector (to southbound I-405). The southbound off-ramp to NE 160th Street will be reconstructed to accommodate the mainline widening. The existing pavement will be widened up to 15 feet to the outside (west) to accommodate the new lane.

- **Southbound, NE 160th Street to NE 124th Street:** WSDOT proposes one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by up to 15 feet to the outside (west) from the NE 160th Street interchange southward to approximately NE 145th Street. At that point, WSDOT will widen the roadway to the inside (east) to approximately NE 132nd Street. WSDOT will restripe the pavement in the vicinity of Sound Transit's proposed Totem Lake Freeway Station/NE 128th Street Project south of there. The on-ramp from NE 160th Street, including the existing noise wall on top of the barrier along the roadway shoulder, will also be reconstructed to accommodate the additional southbound lane.

- **Southbound, NE 124th Street to NE 116th Street:** WSDOT proposes one additional general-purpose lane in this area for a total of four general-purpose

lanes and one HOV lane. (For improvements to the 116th interchange, see *Interchange improvements* below).

- **Southbound, NE 116th Street to NE 85th Street:** WSDOT proposes one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet to the outside (west). The bridges over NE 85th Street will remain unchanged. Restriping over these bridges will accommodate the additional lane, resulting in narrower lanes and shoulders.

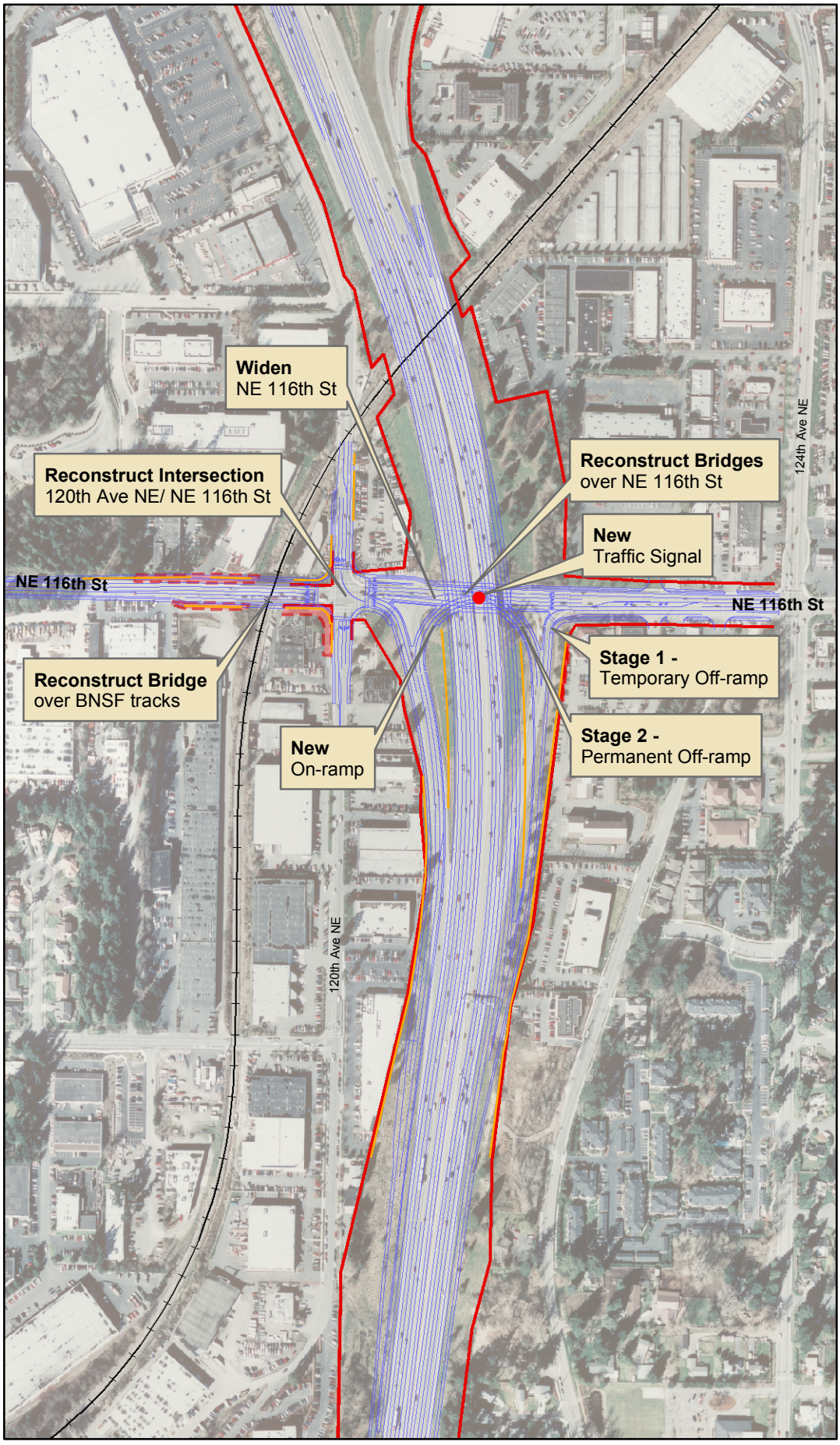
- **Southbound, NE 85th Street to NE 70th Street:** WSDOT proposes one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The new lane will be created by restriping existing pavement, resulting in narrower lanes and shoulders. The existing pavement will be widened to the outside (west) in selected areas to provide space for emergency pullout areas. The existing noise wall on top of the barrier along the roadway shoulder between the pedestrian bridge (south of NE 85th Street) and the off-ramp to NE 70th Street will remain in place with narrower shoulders and lane widths.

- **Southbound, NE 70th Street to SR 520:** WSDOT proposes one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet to the outside (west). The new lane will tie into the existing add lane for the connection to the SR-520 interchange, which is located approximately 330 feet north of the Bellevue city boundary (milepost [MP] 15.83). The existing noise wall on top of the barrier along the roadway shoulder at the end of the NE 70th Street on-ramp will be removed and relocated within the existing right-of-way to accommodate the additional lane and shoulder.

Interchange improvements

NE 116th Street Interchange: The I-405 and NE 116th Street interchange, which is presently configured as a half-diamond, will be reconstructed to a half single point urban interchange (SPUI). The SPUI is a design configuration that provides through and left-turn control from a single traffic signal and free right turns to and from on- and off-ramps (see Figure 4). This provides improved traffic signal phasing and substantial improvements in intersection operations. In redesigning the interchange, the requirements for the Implementation Plan were taken into consideration so that the future lane additions will only need minor structure widening and modifications to on- and off-ramps. Elements of the interchange improvements will include:

- **Reconstructing phased removal and replacing the northbound and southbound I-405 bridges over NE 116th Street**. The bridges will be rebuilt to accommodate the new northbound and southbound lanes, and will provide standard vertical clearance over NE 116th Street.



Legend

- Lane Striping
- Proposed Retaining Wall
- BNSF Railroad
- Existing ROW
- Proposed ROW

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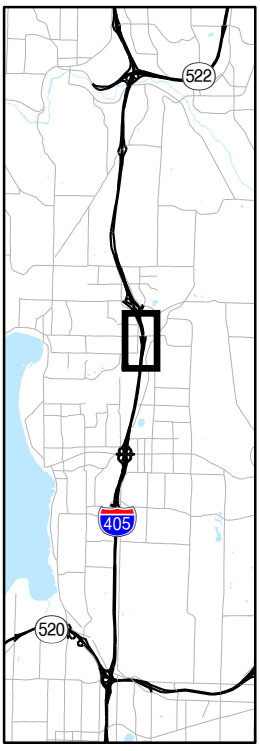


Source: WSDOT; 2004, King County; 2004 | \\SEAW405405gis\project\map_docs\Kirkland\Project_Description\KirklandPD_116thSt.mxd | Last Updated : 12-14-04

Kirkland Nickel Project - NE 116th Street Half Single Point Urban Interchange
FIGURE 4

- **Reconstructing the northbound off-ramp and southbound on-ramp in the new half-SPUI configuration.** As noted previously, this work will be compatible with future construction of the Implementation Plan ramps.

- **Widening NE 116th Street on both sides of the interchange to accommodate dual-turn entrance and exit ramps.** On the west side of the interchange, the widening (on both sides of the street) will extend for approximately 1,700 feet, tapering from approximately 58 feet at the interchange to 43 feet at the west end. East of the interchange, both sides of NE 116th Street will be widened for approximately 900 feet. The curb-to-curb width will be approximately 70 feet from the interchange to the intersection at 124th Avenue NE.

- **Replacing NE 116th Street bridge over the Burlington Northern Santa Fe (BNSF) railroad tracks.** The new bridge will have five traffic lanes with bicycle lanes and sidewalks on both sides of the roadway.

- **Reconstructing the 120th Avenue NE and NE 116th Street intersection.** The purpose of this improvement is to accommodate an additional eastbound through lane on NE 116th Street and improve turning radii at corners.

Other Interchange Improvements

Several existing traffic safety issues will be addressed by Kirkland Nickel Project improvements to interchanges. For example, accident data collected at the NE 85th Street interchange indicates a HAL where traffic from the southbound off-ramp merges with westbound traffic on NE 85th Street.

This condition is caused by off-ramp traffic directly merging into a right-turn-only lane to 114th Avenue NE. WSDOT will improve traffic safety at this location by rebuilding a portion of the off-ramp (approximately 200 feet) so that it intersects with the NE 85th Street westbound through lanes at an angle closer to 90 degrees.

Another HAL occurs at the northbound off-ramp at the NE 85th Street interchange. This problem is associated with insufficient traffic gaps in eastbound NE 85th Street (SR 908) traffic that causes vehicles on the northbound off-ramp to queue up. WSDOT will install a traffic signal on NE 85th Street to alleviate the problem. Additionally, approximately 200 feet of the northbound off-ramp will be reconstructed so that vehicle queues will not back up onto I-405.

Traffic modeling indicates that, with or without the Kirkland Nickel Project, by 2030, traffic on the southbound off-ramp to NE 70th Place could back up onto the mainline. To prevent this situation, WSDOT will add a right-turn lane, approximately 350 feet long, to the off-ramp.

Local roadway widening

WSDOT will widen NE 116th Street as part of the reconfiguration of the interchange. On the west side of the interchange, the widening (on both sides of the street) will extend west for approximately 1,700 feet, tapering from a width of approximately 58 feet at the interchange to 43 feet at the west end. East of the interchange, both sides of NE 116th Street will be widened for approximately 900 feet. Curb-to-curb width will be approximately 70 feet from the interchange to the intersection at 124th Avenue NE.

WSDOT will also add a left-turn pocket on 120th Avenue NE at its intersection with NE 116th Street, and replace the NE 116th bridge over the BNSF railroad tracks.

Retaining Walls

In general, the widening of I-405 for the Kirkland Nickel Project will require retaining walls along portions of the northbound NE 116th Street off-ramp and the I-405 mainline around the NE 116th Street bridge abutments. Retaining walls will also be necessary along NE 116th Street to accommodate street widening. These improvements will occur at the southbound on-ramp from NE 160th Street and at the northbound off-ramp of the NE 116th Street interchange. Improvements will be made at other locations where wetlands must be avoided and to keep grading within the right-of-way.

Project geologists have identified a steep landslide hazard area along the I-405 Corridor between MP 23.03 and 23.08 on the western side of I-405 just south of the SR 522 interchange. Seepage is evident in the slide face, and erosion has occurred within 60 feet of the pavement edge. To prevent further deterioration of the slide face, the following elements or combination of elements will be constructed:

- horizontal drains installed into the slide to drain the area;
- surficial drains installed along the freeway to convey stormwater runoff to detention sites;
- rock fill placed along the slide face to buttress selected areas of the slide face; and
- construction of a retaining wall approximately 100 feet long down slope from the freeway.

The retaining wall will be composed of either soldier piles and lagging or contiguous concrete caissons/piles installed to a depth of some 30 to 40 feet. These piles may be further supported by tieback elements.

Context Sensitive Solutions

The Kirkland Nickel Project is being planned, developed, and designed in accordance with context sensitive solutions (CSS) guidelines, which incorporate the elements of mobility, safety, environment, and aesthetics throughout the project. These guidelines integrate community values with local, regional, and national requirements for the safe, efficient, and effective movement of people and goods. Adhering to these guidelines, the Kirkland Nickel Project is being developed to fit its physical surroundings and preserve these community settings.

Throughout development of the Kirkland Nickel Project, local input is being encouraged to ensure that community concerns are addressed. WSDOT has developed the Kirkland Advisory Committee (KAC) to review Kirkland-area "view to" issues such as interchange locations/designs, noise wall locations/treatments, traffic, safety, structures, lighting, and landscape. Several KAC members also serve on a corridor-wide CSS Aesthetic Committee, focused on the "view from the corridor" viewshed. The Aesthetic Committee's work, combined with the KAC, has determined an I-405 theme of "Culture, Nature, and Progress," that will carry into corridor-wide and local I-405 designs.

WSDOT has established a memorandum of understanding with the City of Kirkland that commits to continued interaction and review by the KAC and Aesthetic Committee

throughout the design process as needed. A CSS Urban Design Guidelines Manual, incorporating KAC design preferences, is being developed to coordinate with the scope of work in the Kirkland Nickel contract documents.

Through a series of interactions with the public, elected officials, WSDOT, and City of Kirkland staff, the I-405 CSS team has developed design themes to guide future improvements along the corridor. KAC, described above, initiated a list of concerns to be addressed throughout the advisory process, and at each of their monthly meetings, the list is reviewed and updated. By the tenth KAC meeting, 90% of the identified issues had been covered, many of those related to CSS. At each meeting, the CSS team prepared illustrations and photos of design features, beginning with examples of local baseline designs compared to options from other parts of the Country, which were shown to the Committee to start identifying preferences.

As the KAC meetings progressed, the Committee preferences were narrowed down to features that could be incorporated into the Urban Design Guidelines Manual for the I-405 Corridor. Along the way, the corridor-wide Aesthetic Committee and WSDOT's Technical Committee reviewed preferences to ensure they fit with corridor-wide aesthetics and maintenance standards. Through a very active meeting and design process, the KAC, Aesthetic Committee, and Technical Committee are nearly complete with their input to the Urban Design Guidelines Manual, which is expected to be published in the spring of 2005.

Right-of-Way Acquisition and Easements

Although most of the Kirkland Nickel Project will be constructed in existing right-of-way, WSDOT will need to acquire property and easements in several areas. These areas are adjacent to the Brickyard Park-and-Ride, in the vicinity of the NE 116th Street interchange, on the west side of I-405 at NE 145th Street, and near East Riverside Drive in Bothell. In addition, property will be acquired for wetlands mitigation at two or more locations. In total, WSDOT will need to acquire approximately 5.25 acres for right-of-way and detention ponds for the project.

Included in this acreage is 2.1 acres of property that WSDOT will acquire from King County Metro to construct a new southbound on-ramp from NE 160th Street and a detention pond. The land is currently vacant and partially covered by a wetland.

In the vicinity of the I-405 and NE116th Street interchange, WSDOT will acquire approximately .75 acres of property from ten property owners along NE 116th Street west of the interchange. Table 2-1 shows the location of property acquisitions in this area. The purpose of these acquisitions will be to widen and add turn lanes on NE 116th Street and 120th Avenue NE. Full acquisition and relocation of a transmission repair service will be necessary. Partial acquisitions of narrow strips of property will be necessary from the other nine parcels; these acquisitions will not affect the operations of those businesses during construction or operation.

WSDOT will also acquire 7.6 acres of land for wetlands mitigation and enter into a Memorandum of Agreement with the City of Kirkland to use 4.5 acres of city property for wetland mitigation.

On the east side of the interchange, the widening of NE 116th Street will take place within existing City of Kirkland right-of-way; WSDOT will not need to acquire additional property. All acquisitions and relocations will be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of

1970, as amended. Relocation resources are available, without discrimination, to all eligible residential and business relocates.

Table 2-1: Property Acquisitions and Easements

No.	Purpose of Acquisition or Easement	Address	Current Land Use	Parcel Size (sq. ft.)	Acquisition Area (sq. ft.)	Easement Area (sq. ft.)
1	Detention Pond	11325 E Riverside Drive	Residential	40,042	40,042	NA
2	Temporary Construction Easement	11217 E Riverside Drive	Residential	143,748	NA	1,923
3	Detention Pond	11323 E Riverside Drive	Residential	53,583	NA	2,864
4	Detention Pond	11321 E Riverside Drive	Residential	74,052	NA	6,175
5	Temporary Construction Easement	11403 E Riverside Drive	Residential	63,395	NA	4,611
6	Temporary Construction Easement	No Address	Vacant	4,500	NA	2,785
7	Detention Pond Roadway Slopes	15062 Juanita-Woodinville Way NE	Future Park-and-Ride Expansion	794,099	91,940	NA
8	Detention Pond	11414 NE 145th Street	Residential	65,340	65,340	NA
9	Roadway Widening	11725 NE 116th Street	Light Industrial	460,865	1,375	13,735
10	Roadway Widening and Subterranean Easement	117th Avenue NE and 118th Street	Vacant	81,893	2,463	6,442
11	Roadway Widening	11822 NE 116th Street	Commercial	73,616	4,162	1,804
12	Roadway Widening	11910 NE 116th Street	Commercial	81,000	3,489	2,455
13	Roadway Widening	11603 120th Avenue NE	Transmission Shop	17,000	17,000	NA
14	Roadway Widening	11616 120th Avenue NE	Car Dealership	41,726	321	NA
15	Roadway Widening	11801 NE 116th Street	Car Dealership	86,528	135	162
16	Roadway Widening	11803 NE 116th Street	Commercial	296,505	2,018	956
17	Roadway Widening	11447 120th Avenue NE	Commercial	42,361	1,344	4,510
18	Roadway Widening and Temporary Construction Easement	11520 120th Avenue NE	Truck Refueling	14,240	401	NA
19	Noise Wall	9042 118th Avenue NE	Costco Parking Lot	32,050	NA	7,958
20	Temporary Construction Easement	11314 120th Avenue NE	Commercial	27,300	NA	6,234
21	Temporary Construction Easement	No Address	Vacant	111,514	NA	1,113
22	Wetland Mitigation[1]	9501 124th Ave NE	Wooded	215,819		215,819[2]
23	Wetland Mitigation[1]	9258 Slater Ave NE	Lawn	136,495	136,495	
24 and 25	Wetland Mitigation[1]	214th Street NE and 14th Ave SE	Wooded	202,118	202,118	

1 See Exhibit 5-40 for the location of these sites.
2 City of Kirkland property.

Clearing and Grading Quantities

Approximately 75 acres of clearing and grading will be required to construct the additional lanes. Project earthwork will require approximately 175,000 cubic yards of cut and 265,000 cubic yards of fill. Construction of the Forbes Lake East wetland mitigation

site will require excavation and removal of 20,000 to 30,000 cubic yards of material. Removal of this material, which is expected to take place over six to nine months, will generate 2,000 to 3,000 truck trips on 124th Avenue NE and other arterials.

Construction Methods and Material and Equipment Staging

The at-grade construction work for new lanes and shoulders will include the removal of existing asphalt and concrete surfaces, clearing and grading adjacent areas, laying the aggregate roadway foundation, and placing asphalt surfaces. Construction equipment such as backhoes, excavators, front loaders, pavement grinders, jack hammers, trucks, as well as grading and paving equipment, will be used.

The project's only new bridge structures are for replacement of the I-405 bridges over NE 116th Street and the NE 116th Street bridges over the BNSF tracks. No in-water work is required to build these bridges. Construction equipment used for aerial structures includes cranes, pile drivers (if allowed by resource agencies), drilling rigs and augers, backhoes and excavators, jack hammers, concrete pumping equipment, and slurry processing equipment.

A conceptual traffic staging plan showing how traffic will be maintained during construction has been developed to illustrate how construction can occur with minimal disruptions to existing traffic patterns and capacity on the I-405 mainline, the interchanges, and the local roadways.

The primary objectives of this plan are to maintain existing traffic capacity, and to streamline the construction schedule. The contractor will obtain detour agreements from the local agencies prior to construction.

I-405 is periodically used by vehicles with over-sized loads to transport freight through the central Puget Sound area. Both during and after construction, WSDOT will continue to use its existing permit process to accommodate oversized loads. Oversized loads should be moved at off-peak periods and as allowed by their special permits.

Staging areas in previously disturbed right-of-way areas will provide space for employee parking, large equipment storage, and material stockpiles. Construction staging will occur within areas of existing or newly-acquired right-of-way adjacent to the mainline; however, this does not mean that staging will not occur elsewhere. The contractor has the option and likely will find additional locations for storage and staging. WSDOT will allow staging areas in already disturbed parts of the right-of-way without trees. Staging for construction will not occur in environmentally sensitive areas. Likely staging areas include the following:

- Right of way areas along the project limits, which are generally adequate to perform the work with typical machinery, including room for onsite staging;
- Spaces between the mainline and the southbound NE 70th Street on- and off-ramps;
- Space within the northwest quadrant of the NE 85th Street loop ramp;
- Triangular areas between the on- and off-ramps and the mainline at the northwest, northeast, and southwest quadrants of the NE 85th Street interchange;
- Space within the southbound NE 116th Street on-ramp;

- Northbound and southbound along the mainline, between NE 116th Street and the BNSF bridges where extra-wide WSDOT right of way exists. The northbound side has a wetland area near NE 116th Street that will be delineated by high visibility fencing, but the remaining workable area is greater than 1.5 acres;

- Spaces within the northeast, southeast, and southwest quadrants of the NE 124th Street interchange; and

- Spaces within the northwest, northeast, southwest, and southeast quadrants of the NE 160th Street interchange.

The Biological Assessment prepared for the project contains the following performance standards for staging areas:

- No contractor staging areas will be allowed within 90 meters (300 feet) of any wetland, stream, or river with listed species.

- Temporary materials storage piles will not be placed within the 100-year floodplain between October 1 and May 1. Material used within 12 hours of deposition will not be considered a temporary material storage pile. All temporary material storage piles will be protected by appropriate BMPs to prevent sediments from leaving the piles.

- When practicable, all equipment fueling and maintenance will occur more than 90 meters (300 feet) from the nearest wetland, ditch, or flowing or standing water. (Fueling large cranes, pile drivers, and drill rigs over 90 meters (300 feet) away may not be practicable.)

- Project contractors will confine construction projects to the minimum area necessary to complete the project.

- Project contractors will flag boundaries of clearing limits associated with site access and construction to prevent ground disturbance outside the limits.

Project Construction Schedule

Construction is expected to take place in stages, with the entire construction phase lasting up to six years beginning in 2005 and ending in 2011. It is likely that the Kirkland Nickel Project will be constructed in two stages. Stage 1, which is approximately 1.8 miles long, will provide immediate relief in Kirkland's worst congestion areas. WSDOT expects that the first stage of roadway construction, scheduled to begin in the latter half of 2005 and last until 2007, will include the following major elements:

- Construction of new northbound and southbound lanes and shoulders of I-405 between NE 85th Street and NE 124th Street;

- Reconstruction of the northbound off-ramp of the NE 116th Street interchange and minor modifications to the southbound on-ramp. If funding is available, reconstruction of the southbound on-ramp will be completed;

- Construction of related stormwater management facilities and noise walls between NE 85th Street and NE 124th Street;

- Reconstruction of the northbound and southbound bridges over NE 116th Street in preparation for the interchange configuration that will take place in Stage 2;

- Construction of a fish passage facility on Forbes Creek; and

- Construction of wetland mitigation for the entire project.

WSDOT anticipates that the second stage of the project, scheduled to begin in 2009 and last into 2011, will be made up of the following roadway construction elements:

- Restriping of the northbound lane and shoulder from the NE 70th Street interchange to the NE 85th Street interchange;

- Construction of a new southbound lane and shoulder on I-405 from the SR 522 interchange to the NE 124th Street interchange;

- Reconstruction of the NE 116th Street bridge over the BNSF tracks;

- Construction of a new southbound lane and shoulder from the NE 85th Street interchange to the add lane north of the SR 520 interchange;

- Construction of related stormwater management facilities and noise walls between NE 70th Street and NE 85th Street and NE 124th Street and SR 522;

- Reconfiguration of the NE 116th Street interchange into a half SPUI and widening and improvements to NE 116th Street and the NE 116th Street/120th Avenue NE intersection.

It should be noted that Stage 2 requires some narrower lanes and shoulders to avoid rebuilding the interchanges at NE 70th, NE 85th, and NE 124th Streets. Future projects for this area are expected to rebuild each of these interchanges.

2.2.3 Stormwater Management

Stormwater Design Standards

The stormwater management facilities for the Kirkland Nickel Project have been designed to comply with the following guidelines and procedures:

- WSDOT Highway Runoff Manual M 31-16, March 2004

- WSDOT Hydraulics Manual M 23-03, March 2004

In most cases, water quality treatment is required for 100 percent of new impervious surfaces along with detention of the two-year through 50-year storms. Additional design references and guidelines have been used as they apply for local jurisdictional requirements. Design of storm drainage improvements for the Kirkland Nickel Project will use the WSDOT Highway Runoff Manual (2004) as the primary design reference.

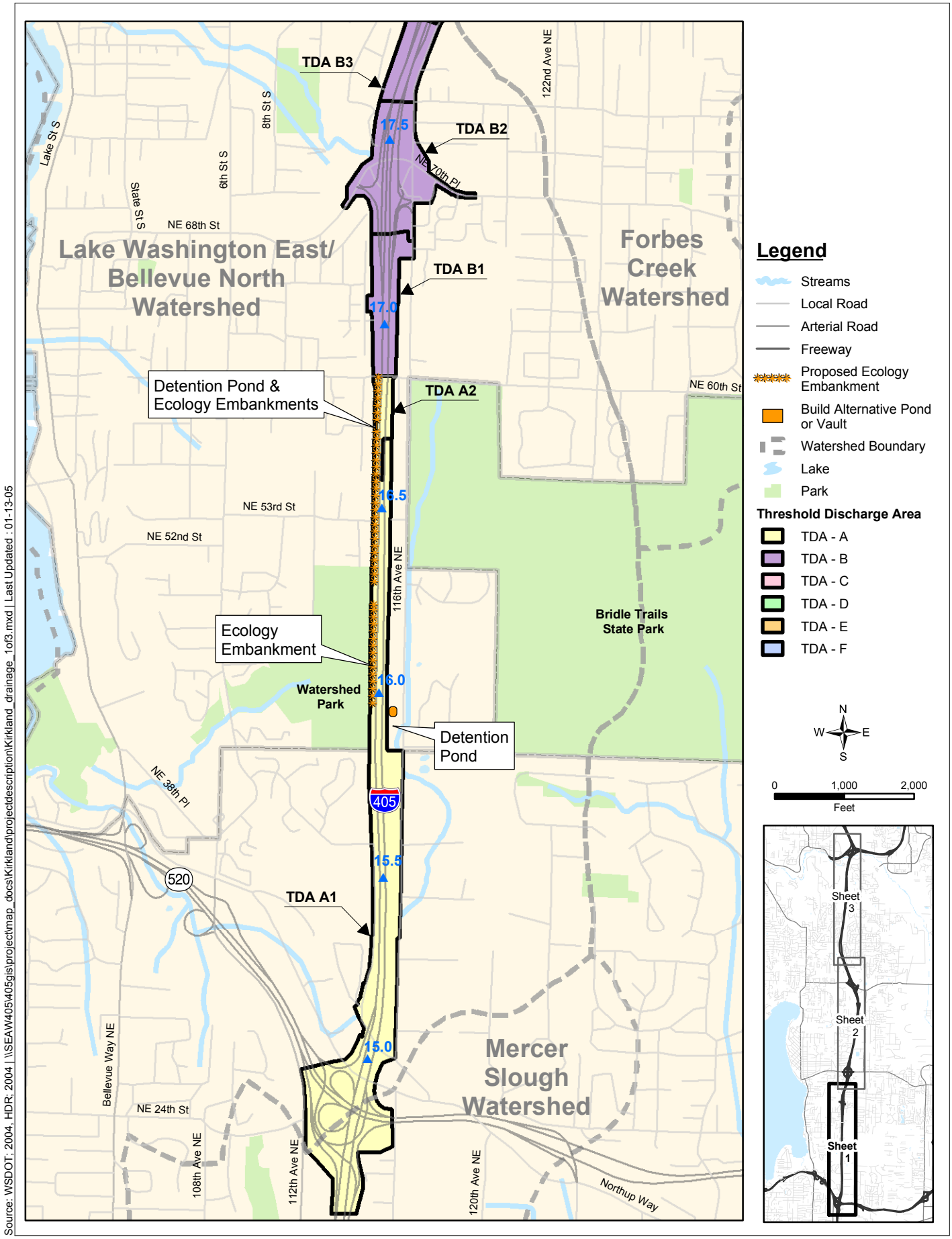
Stormwater runoff treatment for both quantity and quality will be provided through use of Best Management Practices (BMPs) in accordance with the WSDOT Highway Runoff Manual or through ongoing efforts to identify and develop watershed characterization and improvement opportunities within the Kirkland Nickel Project area.

Watersheds in the Project Area

The Kirkland Project stretches approximately eight miles from the SR 520 interchange to the SR 522 interchange and spans four primary watersheds, listed south to north, as follows:

- Lake Washington East/Bellevue North
- Forbes Creek
- Juanita Creek
- Sammamish River

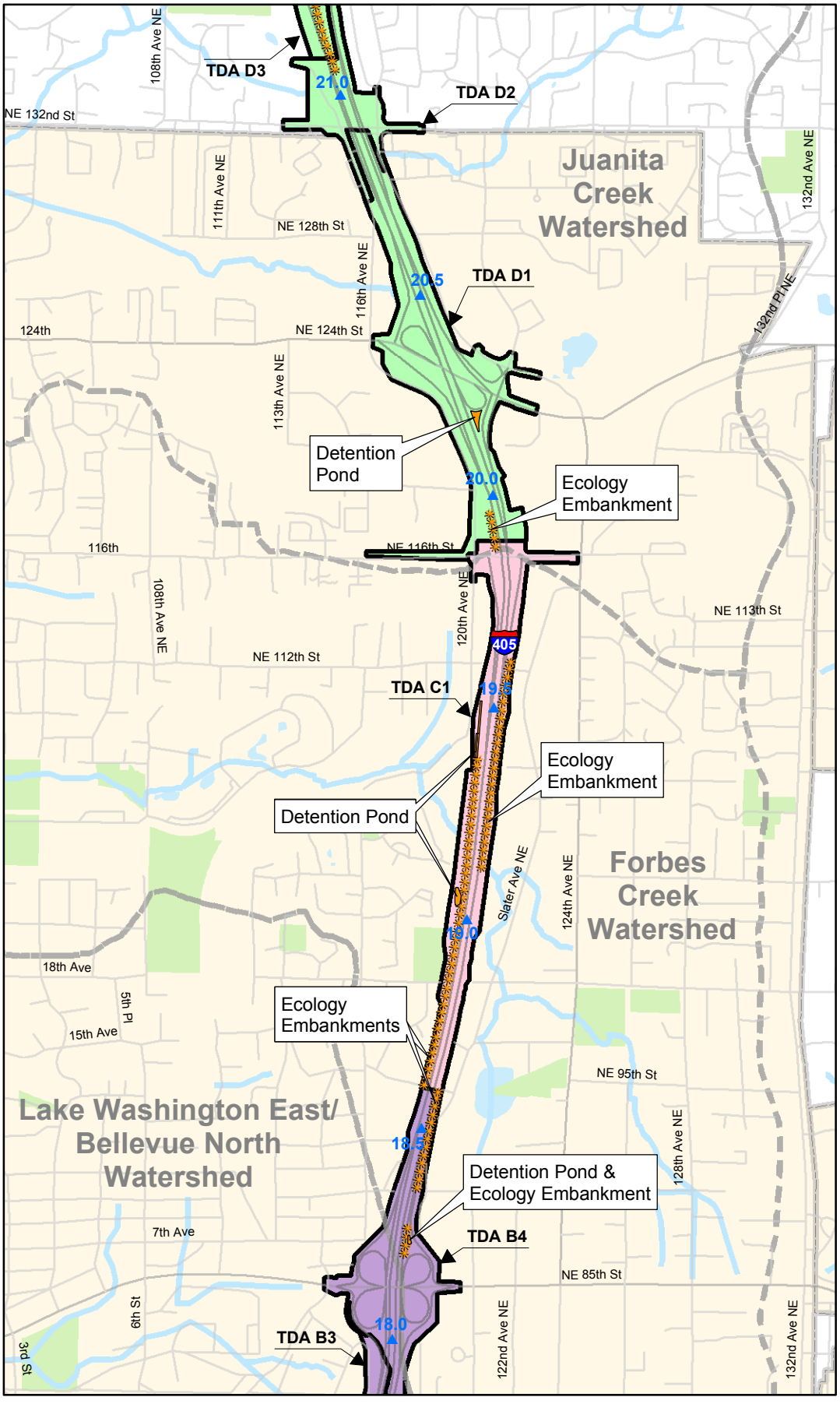
Approximate watershed boundaries are shown in Figure 5, sheets 1-3. Within the I-405 Corridor, these watershed basins are comprised of six sub-basins delineated by high and low points along the corridor profile. These sub-basins encompass a total area of approximately 556 acres. These six sub-basins are further broken into 18 Threshold Discharge Areas (TDAs), which are defined as onsite areas draining to a single natural discharge location within 0.25 miles downstream of I-405. The TDAs are associated with the various cross-drains and outfalls along the corridor. The design team used TDAs as basic geographic units for application of stormwater treatment measures to maintain existing drainage patterns. Figure 5, sheets 1-3, show the TDA boundaries. A summary of TDA outfall locations for the Kirkland Nickel Project is provided in Table 2-2.



Source: WSDOT; 2004, HDR; 2004 | \\SEAW405\405gis\projectmap_docs\Kirkland\projectdescription\Kirkland_drainage_1of3.mxd | Last Updated : 01-13-05

Kirkland Nickel Project Proposed Improvements - Watersheds

FIGURE 5 | 1 of 3



Legend

- Streams
- Local Road
- Arterial Road
- Freeway
- Proposed Ecology Embankment
- Build Alternative Pond or Vault
- Watershed Boundary
- Lake
- Park

Threshold Discharge Area

- TDA - A
- TDA - B
- TDA - C
- TDA - D
- TDA - E
- TDA - F

N
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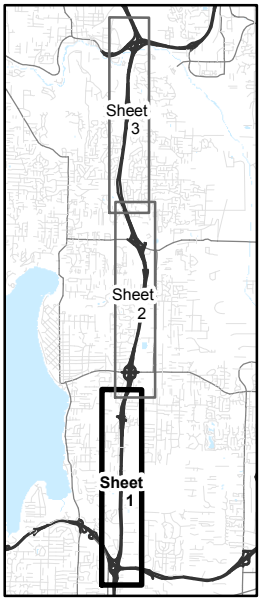
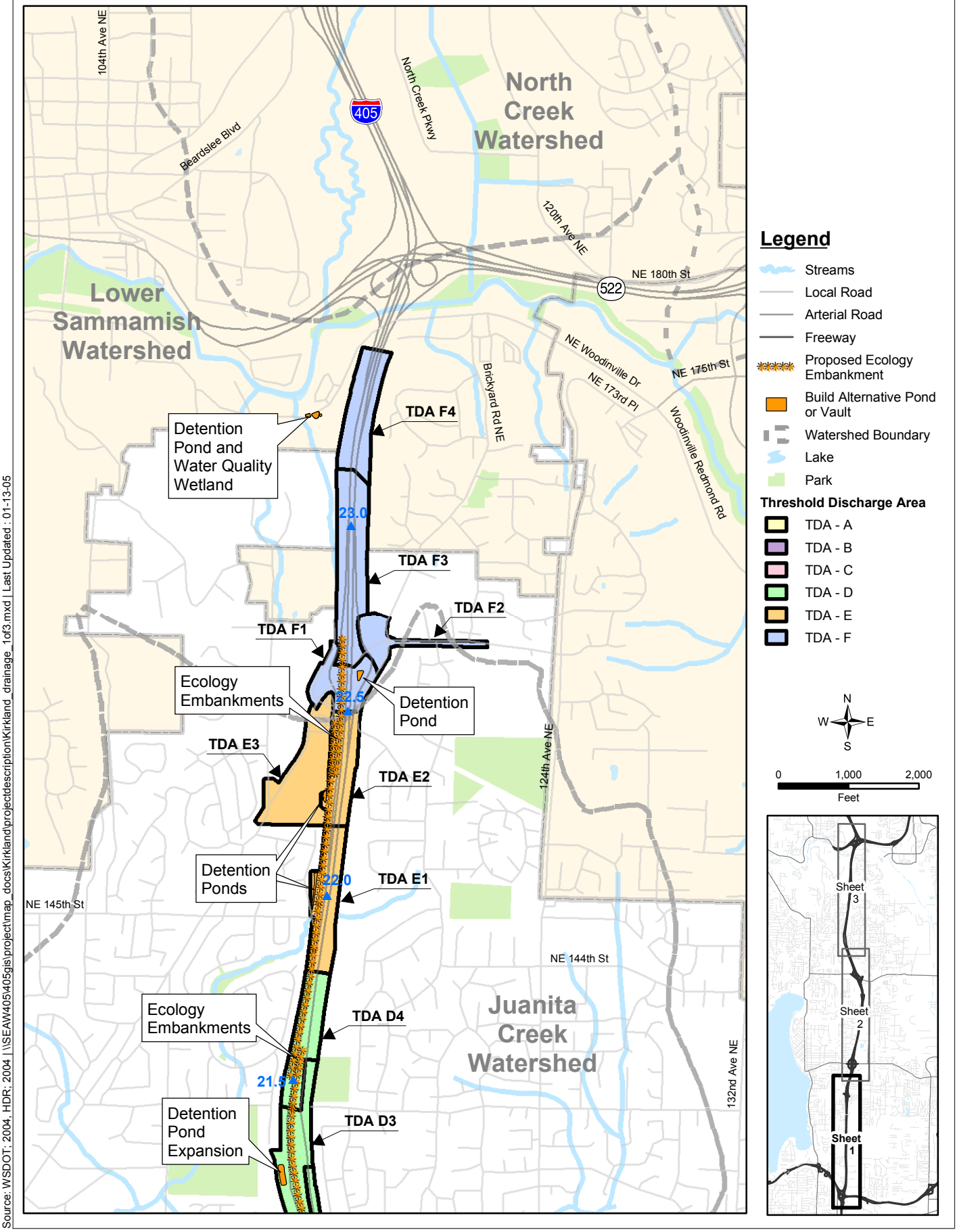
0 1,000 2,000
Feet



Source: WSDOT; 2004, HDR; 2004 | \\SEAW405\405gis\project\map_docs\Kirkland\projectdescription\Kirkland_drainage_1of3.mxd | Last Updated : 01-13-05

Kirkland Nickel Project Proposed Improvements - Watersheds

FIGURE 5 | 2 of 3



Source: WSDOT; 2004, HDR; 2004 | \\SEAW405\405gis\project\map_docs\Kirkland\projectdescription\Kirkland_drainage_1of3.mxd | Last Updated : 01-13-05

Kirkland Nickel Project Proposed Improvements - Watersheds

FIGURE 5 | 3 of 3

Table 2-2: Kirkland Nickel Project Threshold Discharge Area Outfalls

TDA	Outfall I.D.	Milepost	Facility	Outfall to
A1	1	15.87	Detention Pond	Yarrow Creek
A2	2	16.71	Detention Vault	Existing storm drainage
B4	3	18.20	Detention Pond	Existing storm drainage
C	4	19.16	Detention Pond	Roadside ditch
C	5	19.45	Detention Vault	Existing storm drainage
D1	6	20.20	Detention Pond	Existing ditch
D3 & D4	7	21.28	Detention Pond	Existing ditch
E1	8	21.90	Detention Pond	Juanita Creek
E2	9	22.22	Detention Pond	Existing ditch
F1	10	22.60	Detention Pond	Existing storm drainage
F3 & F4	11	23.25[1]	Combined Stormwater Treatment Wetland/ Detention Pond	Existing storm drainage to the Sammamish River

[1] *Proposed facility located approximately 850 feet to the west of I-405 MP 23.25.*

Stormwater Management Facilities

The Kirkland Nickel Project will increase impervious surface areas by 16.11 acres, approximately 5 percent more than current conditions. Average annual stormwater runoff volume for the entire project will increase by approximately 29 acre-feet per year. Runoff volumes and peak flows for individual storm events will also increase. The Build Alternative includes construction of a new storm drain system that will collect, treat, and discharge highway runoff from the new impervious surfaces and some replaced pavement areas. The highway runoff will be treated by applying both quality and flow-control BMPs in such a manner that the stormwater discharges from the highway will meet water quality and peak discharge criteria required by state and local authorities.

A summary of runoff treatment by TDA is provided in Table 2-3. A summary of flow control and water quality treatment facilities currently proposed with the conceptual design are provided in Table 2-4 and Table 2-5.

Stormwater Flow Control

Stormwater detention will be provided for a total of 13.56 acres of new pavement project wide (see Table 2-2). This area is slightly less than the new pavement area of 13.50 acres because proposed pavement for two of these TDAs (0.01 acre in TDA-B1 and 0.05 acre in TDA-B2) does not exceed the flow control treatment threshold (greater than 5,000 sq. ft. of net new impervious surface) in the Minimum Requirement 6 of the WSDOT Highway Runoff Manual, thus no flow control is required in those TDAs.

Table 2-3: Summary of Runoff Treatment by Threshold Discharge Area (TDA)

Basin/ TDA	TDA Area (acres)	Existing Impervious Area[1] (acres)	New Impervious Area (acres)	Total Impervious Area Being Treated (acres)	Percent of New Impervious Area Treated
Lake Washington East/Bellevue North Watershed					
Sub-basin A					
TDA-A1	113.80	58.30	1.08	2.08	193%
TDA-A2	6.80	3.90	0.44	1.39	316%
Sub-basin B					
TDA-B1	19.15	7.19	0.01	0.00	0%
TDA-B2	34.95	18.55	0.00	0.00	0%
TDA-B3	18.31	8.20	0.00	0.00	0%
TDA-B4	50.12	26.41	0.35	3.02	863%
Total	**243.13**	**122.55**	**1.88**	**6.49**	**345%**
Forbes Creek Watershed					
Sub-basin C					
TDA-C1	61.04	26.17	7.92	12.47	157%
Total	**61.04**	**26.17**	**7.92**	**12.47**	**157%**
Juanita Creek Watershed					
Sub-basin D					
TDA-D1	73.91	42.35	0.57	3.69	647%
TDA-D2	23.42	10.83	0.05	0.00	0%
TDA-D3	19.56	5.40	0.53	3.50	660%
TDA-D4	15.23	5.22	0.47	3.12	664%
Sub-basin E					
TDA-E1	15.55	6.72	0.83	2.99	360%
TDA-E2	14.05	6.92	0.32	4.01	1253%
TDA-E3	24.42	5.16	0.00	0.00	0%
Total	**186.14**	**82.60**	**2.77**	**17.31**	**625%**
Sammamish River Watershed					
Sub-basin F					
TDA-F1	13.10	6.66	0.20	1.48	740%
TDA-F2	9.21	5.26	0.00	0.00	0%
TDA-F3 & F4	25.85[2]	19.89	0.79	13.98	1,770%
Total	**65.32**	**31.81**	**0.99**	**15.46**	**1562%**
Project Total	**555.63**	**263.13**	**13.56**	**51.73**	**381%**

[1] Includes I-405, interchanges, and some surface streets.
[2] Proposed facility located approximately 850 feet to the west of I-405 MP 23.25.

Table 2-4: Proposed Flow Control Facilities for Kirkland Nickel Project

TDA	Facility ID.	Approximate MP	Contributing Effective Impervious Surface Area (acres)	Facility Type	Area (square feet)	Detention Depth (feet)	Detention Volume (acre-feet)
A1	A1	15.89	1.08	Pond	8,433	5.0	0.68
A2	A2	16.71	0.44	Vault	2,405	5.0	0.28
B4	B4	18.21	0.35	Pond	3,873	4.0	0.23
C1	C1.1	19.10	1.66	Pond	12,008	5.0	1.02
C1	C1.2	19.40	7.95	Vaults	20,032	10.0	4.60
D1	D1	20.16	0.75	Pond	8,712	2.5	0.50
D3 & D4	D3/D4	21.20	1.00	Pond Expansion	6,534	4.0	0.60
E1	E1	22.00	0.83	Pond	11,352	3.0	0.65
E2	E2	22.25	0.97	Pond	13,046	3.0	0.76
F1	F1	22.57	0.23	Pond	2,736	4.0	0.15
F3 & F4	F3/F4	23.25[1]	0.79	Combined Pond	3,695	4.5	0.23

[1] Proposed facility located approximately 850 feet to the west of I-405 MP 23.25

Table 2-5: Proposed Water Quality Treatment Facilities for Kirkland Nickel Project

Threshold Discharge Area	Facility ID.	Approximate MP	Contributing Effective Impervious Surface Area (acre)	Facility Type	Facility Length (feet)	Facility Area[1] (square feet)
A1	A1.1	15.89 to 16.22	1.11	Ecology Embankment	1,755	5,750
A1	A1.2	16.28 to 16.57	0.97	Ecology Embankment	1,541	6,164
A2	A2.1	16.57 to 16.69	0.73	Ecology Embankment	633	2,532
A2	A2.1	16.83 to16.84	0.66	Ecology Embankment	579	2,300
B4	B4.1	18.16 to 18.25	1.28	Ecology Embankment	466	1,864
B4	B4.2	18.34 to 18.58	1.74	Ecology Embankment	1,245	4,980
C1	C1.1	18.58 to 19.36	8.23	Ecology Embankment	4,111	16,444
C1	C1.2	19.10 to	4.24	Ecology Embankment	2,584	10,336

Table 2-5: Proposed Water Quality Treatment Facilities for Kirkland Nickel Project

Threshold Discharge Area	Facility ID.	Approximate MP	Contributing Effective Impervious Surface Area (acre)	Facility Type	Facility Length (feet)	Facility Area[1] (square feet)
		19.67				
D1	D1.1	19.85 to19.90	3.69	Ecology Embankment	490	2,450
D3	D3.1	21.06 to 21.40	3.50	Ecology Embankment	1,790	7,160
D4	D4.1	21.41 to 21.56	1.85	Ecology Embankment	1,533	6,132
D4	D4.2	21.48 to 21.77	1.27	Ecology Embankment	815	3,260
E1	E1.1	21.77 to 22.18	2.99	Ecology Embankment	2.080	8,320
E2	E2.1	22.18 to 22.46	2.41	Ecology Embankment	1,496	5,984
E2	E2.2	22.31 to 22.48	1.60	Ecology Embankment	900	3,600
F1	F1.1	22.48 to 22.60	1.48	Ecology Embankment	1,204	4,814
F3 & F4	F3.1	23.25[2]	13.98	Combined Stormwater Treatment Wetland/ Detention Pond	NA	5,073

[1]Facility size area is calculated as length of Ecology Embankment multiplied by 4 feet width (minimum embankment width)
[2] Proposed facility located approximately 850 feet to the west of I-405 MP 23.25.

Detention will be provided in accordance with the WSDOT Highway Runoff Manual in the form of detention/retention ponds and detention vaults.

Infiltration will be used where it is cost-effective and technically feasible to discharge stormwater or otherwise reduce flow control treatment volumes. Current information about surrounding soils and geologic formations indicates that infiltration is not a viable method of discharging stormwater in most of the project area. However, it is believed that pockets of well-draining soils in some upland areas may exist along the corridor.

To evaluate infiltration potential within the Kirkland Nickel Project area, geotechnical borings will be needed to evaluate depth to groundwater and the permeability of sub-soils. Testing is currently being conducted to identify areas where infiltration may be technically feasible per project design standards.Water Quality Treatment Facilities

The Kirkland Nickel project will provide enhanced water quality treatment for all new pavement areas. In addition, 38.17 acres of presently untreated impervious surface will be retrofitted for enhanced water quality treatment. In total, the project will treat 51.73 acres of impervious surface, or 321 percent of the new impervious surfaces to be created by the project (see Table 2-1). These improvements will be provided in accordance with the WSDOT Highway Runoff Manual in the form of combined treatment

systems, ecology embankments (see Figure 6), and constructed stormwater treatment wetlands (see Table 2-3). Ecology embankments are the preferred method of treatment because of their flexibility in construction, enhanced treatment capabilities, and relatively low cost.

Ecology embankments are applications of Limited Impacted Development (LID) technologies that provide enhanced water quality treatment. The project will typically use LID BMPs where cost-effective and technically feasible. LID systems provide simpler and less expensive-to-install facilities that generally use both media and biofiltration processes combined with direct infiltration for discharge. While not feasible at all locations along the corridor, LIDs better replicate natural conditions for runoff treatment and flow control.

Stormwater management facilities will also include spill control measures to prevent damage to the proposed transportation facilities and adjacent properties.

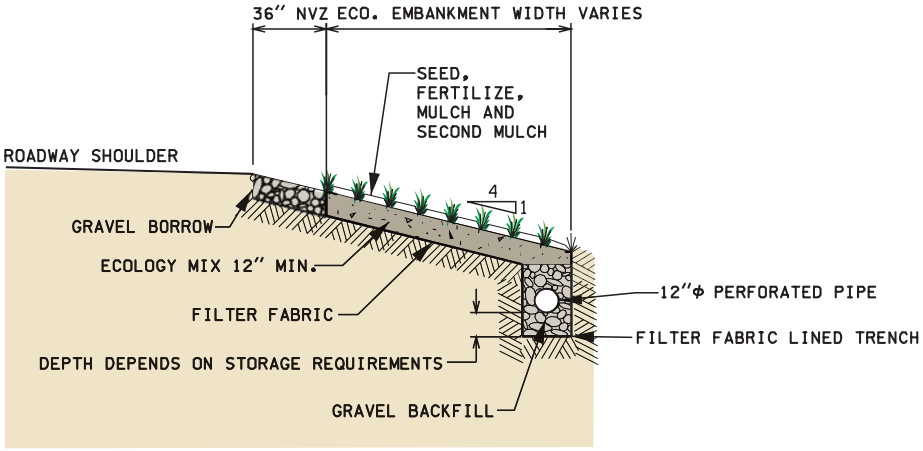
Drainage Collection and Conveyance

Existing drainage structures and systems will be retained in places where they will not be disturbed by new construction. Where space and structure access make it possible, open roadside ditches will be used as the preferred conveyance method. Open ditches on the edges of the shoulders will be the preferred collection system where right-of-way and grading conditions allow.
New drainage structures will be added and existing structures will be removed in order to incorporate new stormwater management facilities, or mitigate existing drainage issues. Generally, proposed collection and conveyance systems will consist of standard WSDOT catch basin and manhole structures connected by lateral and trunk drains to the treatment and flow control facilities. Pipe sizes will generally range from 12 to 30 inches in diameter and be installed on grades and at depths necessary for proper vertical clearances and hydraulic performance. Inlets are placed at locations necessary to limit the spread of design flows into the travel lanes, as required by the WSDOT Hydraulics Manual (2004).

Culverts

WSDOT anticipates that improvements to the freeway mainline and associated interchanges will impact some existing cross-culverts. Each impacted culvert will be checked with WSDOT maintenance personnel to evaluate the proposed improvements and address any maintenance concerns. Table 2-6 provides information about cross-culverts that may be impacted by the new roadway improvements. Associated culvert improvements include lengthening, placement and connection to new drainage structures, end treatment stabilization, and replacement.

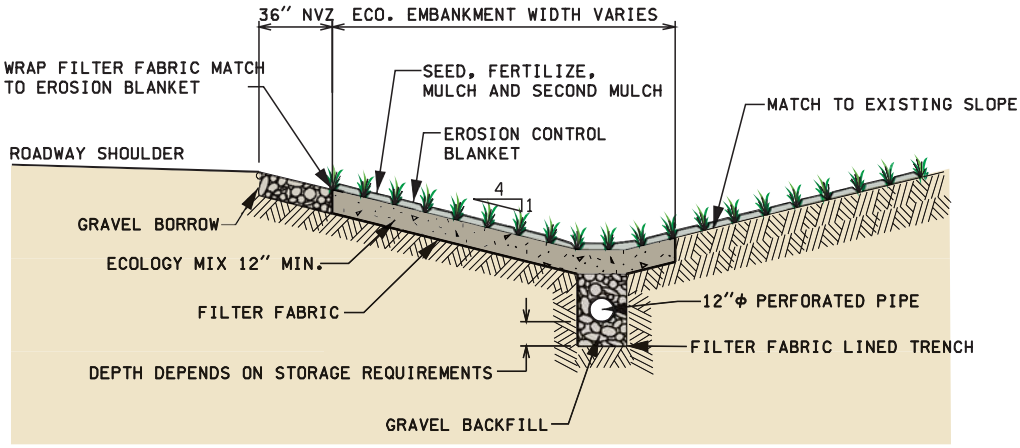
Culvert extensions will be added to existing drainage culverts in areas where the grading limits to accommodate the new roadway widen. These extensions will be added at either the upstream or the downstream end, depending on which end is affected by the grading limits change. Each potential culvert extension was reviewed for potential impacts to stream areas. In locations where potential impacts were identified, construction of headwalls (retaining walls around culverts) or other retaining features have been specified to avoid the need for culvert extensions. A new structure providing fish passage under I-405 and carrying normal stream flows will be constructed at Forbes Creek, while the existing culvert (or a similarly-sized replacement) will be used to pass stream high flows.



ECOLOGY EMBANKMENT

NVZ = NON-VEGETATED ZONE

NOT TO SCALE



ECOLOGY EMBANKMENT /DITCH SECTION

NVZ = NON-VEGETATED ZONE

NOT TO SCALE

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Adapted from WSDOT Highway Runoff Manual, March 2004.

Ecology Embankment Features

FIGURE 6

Table 2-6: Proposed Construction at Cross-Culverts

Culvert ID	TDA	Culvert Size	Mile post	Direction Affected	Construction Activity
1	A1	Unknown	15.95	Southbound	Replace 190 ft. culvert, add catch basins
2	A1	18"	16.07	Southbound	Extend west approx. 13 ft., add catch basin
3	A1	18"	16.18	Southbound	Extend west approx. 15 ft., add catch basin
4	A1	18"	16.32	Southbound	Extend west approx. 13 ft., add catch basin
5	A1	24"	16.47	Southbound	Extend west approx. 15 ft., add catch basin
6	A1	18"	16.51	Southbound	Extend west approx. 16 ft., add catch basin
7	A1	Unknown	16.55	Southbound	Extend west approx. 16 ft., add catch basin
8	A2	Unknown	16.70	Southbound	Construct detention vault on west side
16	C1	12"	18.57	Both	Extend west approx. 20 ft., east 15 ft., construct headwall on east side
17	C1	24"	18.79	Southbound	Extend west approx. 22 ft., add catch basin
18	C1	18"	18.96	Southbound	Extend west approx. 25 ft., add catch basin, headwall on east side
19	C1	24"	19.07	Southbound	Extend west approx. 20 ft.
20	C1	30"	19.14	Both	Construct new Forbes Creek fish passage culvert 490 ft. long
21	C1	24"	19.42	Both	Extend east approx. 30 ft., add catch basins
22	C1	24"	19.59	Southbound	Replace 300 ft. culvert, add catch basins
23	C1	24"	19.83	Neither	Replace collection system in NE 116th Street
27	D3	24"	21.23	Southbound	Extend approx. 20 ft. into median, add catch basin
28	D3	30"	21.27	Southbound	Extend approx. 30 ft. into median, replace outfall on west side
29	D3	30"	21.41	Southbound	Extend approx. 35 ft. into median, replace catch basin
30	D4	18"	21.54	Neither	Adjust catch basin in median
34	E2	18"	22.28	Southbound	Extend west approx. 72 ft, add catch basins
35	F1	24"	22.60	Neither	Replace damaged culvert (approx. 152 ft.)
37	F3	24"	22.84	Northbound	Construct collection system and catch basins in shoulder
38	F3	18"	22.90	Northbound	Construct collection system and catch basins in shoulder
39	F3	18"	22.98	Northbound	Construct collection system and catch basins in shoulder
40	F3	18"	23.13	Northbound	Construct collection system and catch basins in shoulder
41	F4	18"	23.18	Both	Construct collection system and catch basins in shoulder
43	F4	24"	23.35	Neither	Construct collection system and catch basins in shoulder with flow splitter

Lake Washington East – Bellevue North Stormwater Management Improvements

All stormwater from the sub-basin A portions of this project, which stretches from State Route (SR) 520 and extends north to a relatively high point on the corridor profile at NE 60th Street and includes TDA-A1 and TDA-A2, converges in Yarrow Creek and is conveyed to Yarrow Bay and Lake Washington, approximately 0.5 miles west of the I-405/SR 520 interchange. Runoff from the sub-basin B portions of this project, which extends north from NE 60th Street to the vicinity of the NE 85th Street Interchange and includes TDA-B1 and TDA-B2, discharges through a network of streams, ditches, and closed pipe conveyance systems through developed neighborhoods flowing west to Lake Washington.

TDA-A1 (Figure 5, sheet 1) will use a detention pond at approximate Milepost (MP) 15.9 along the east side of the corridor and discharge to Yarrow Creek. Ecology embankments will be constructed along the west side of the freeway adjacent to the new pavement areas.

TDA-A2 (Figure 5, sheet 1) will use a stormwater detention vault at approximately MP 16.7 along the west side of I-405. Ecology embankments will be constructed along the new pavement areas at the western edge of the roadway.

TDA-B1 (Figure 5, sheet 1), will have 0.01 acres of net new impervious area associated with the Kirkland Nickel Project.

TDA-B2 and TDA-B3 (Figure 5, sheets 1 and 2) will have no new impervious surface associated with the Nickel Project. No storm drainage improvements would be implemented in these TDAs.

TDA-B4 (Figure 5, Sheet 2) will include a new detention pond at the infield area of the northbound (NB) on-ramp near the NE 85th Street intersection at approximately MP 18.2. Ecology embankments will be constructed along the east side of the adjacent mainline roadway.

Forbes Creek Watershed Stormwater Management Improvements

The Kirkland Nickel Project area draining to the Forbes Creek watershed is comprised of a single threshold discharge area, TDA-C1 (Figure 5, sheet 2). TDA-C1 will be provided with flow control treatment in two separate flow control facilities.

Beginning from the south, a pond will be constructed on the west side of the freeway at approximate MP 19.1. The detention pond will discharge to the existing ditch leading to a cross-culvert to Forbes Creek ravine. Water quality treatment for this area would be provided by roadside ecology embankments along areas of new construction.

Progressing north, a large detention vault would be constructed at approximately MP 19.4. Construction of this vault would displace a small detention pond previously constructed to treat the same stretch of roadway. Discharge would continue to the Forbes Creek tributary as before. Ecology embankments will be constructed along new pavement areas on both sides of the freeway mainline. Conveyance improvements will be provided, as needed, to route storm flows to the appropriate treatment facilities and to rectify the flooding situation at the NE 116th Street interchange.

Juanita Creek Watershed Stormwater Management Improvements

The Juanita Creek watershed is divided into two sub-basins (D and E) that include seven TDAs. The following stormwater management facilities are proposed for the conceptual design:

TDA-D1 (Figure 5, sheet 2) will use a new detention pond constructed in the NB off-ramp infield area of the NE 124th Street interchange at approximately MP 20.16. Ecology embankments will be constructed along portions of the west side of the SB mainline.

TDA-D2 (Figure 5, sheet 2) will have only 0.05 acres of net new impervious surface associated with the Nickel Project, thus no storm drainage improvements would be implemented. Detention for TDA-D3 and TDA-D4 (Figure 5, sheet 3) would be provided in a combined detention facility as part of the Kirkland Nickel Project. An existing detention pond, located within TDA-D3 at MP 21.2, will be expanded, and adjustments will be made to the flow control structure.

Associated conveyance features will be modified to collect and route runoff from TDA-D3 and new pavement areas along the west side of the SB lanes in TDA-D4 to the newly improved pond. Runoff from the east side of the TDA-D4 SB lanes will continue to discharge to the existing culvert system. Ecology embankments will be constructed in TDA-D3 adjacent to the new pavement areas along the SB median. Ecology embankments will also be constructed along new pavement areas at the western edge of the southbound lanes.

TDA-E1 (Figure 5, sheet 3) will use a detention pond constructed in newly purchased right-of-way on the west side of the freeway corridor at MP 22.0. Ecology embankments will convey flows to the pond.

TDA-E2 (Figure 5, sheet 3) will use a detention pond constructed in newly-purchased right-of-way to the west at MP 22.3. Ecology embankments will route flows to the pond.

In TDA-E3, no storm drainage improvements will be implemented for the Kirkland Nickel Project because there is no new or replaced pavement in this TDA.

Sammamish River Watershed Stormwater Management Improvements

Within the project corridor, the Sammamish River watershed is divided into four threshold discharge areas (TDA-F1 through TDA-F4). TDA-F3 and TDA-F4 will be combined as part of the Kirkland Nickel Project.

In TDA-F1 (Figure 5, sheet 3), a new detention pond will be constructed at the infield area in the southeast quadrant of the NE 160th Street off-ramp at approximately MP 22.6. The existing cross culvert at MP22.6 will be replaced. Stormwater from I-405 and the NE 160th Street off-ramp will be routed to this new detention pond Ecology embankments will be constructed along the west side of the freeway adjacent to new pavement areas.

In TDA-F2 (Figure 5, sheet 3), no new or replaced pavement is associated with this TDA, thus no storm drainage improvements will be implemented.

Runoff control and water quality treatment facilities would be combined for TDA-F3 and TDA-F4 (Figure 5, sheet 3) as part of the Kirkland Nickel Project. Storm drainage improvements for TDA-F3 and TDA-F4 include two new high capacity bypass pipes running down slope along the freeway alignment to route high storm flows around a badly eroded and unstable ravine.

Along the east edge of the freeway mainline, a large diameter pipe will be constructed to collect and convey runoff from offsite areas to the east. Adjustments will be made to the existing freeway storm system to separate freeway runoff from offsite runoff, including new curbs and inlet structures. A second bypass line would be constructed along the western edge of the freeway mainline to collect and convey freeway runoff only to a new stormwater treatment facility located offsite at the lower end of the ravine. Runoff conveyed in the offsite bypass line would be distributed to three separate existing outfalls to the Sammamish River by the use of flow splitters. All improvements to the existing conveyance systems would be made at a distance greater than 200 feet away from the river's ordinary high water line.

2.3 The No Build Alternative

The No Build Alternative is WSDOT's continuing routine maintenance that consists of short-term minor construction necessary for continued operation of the existing I-405 facility and minor safety improvements, as required within the project limits, beginning at approximately the I-405/SR 520 interchange and extending northward to the I-405 and SR 522 interchange.

2.4 Programmed and Funded Transportation Projects on or Connecting to I-405

Sound Transit and the City of Kirkland plan to construct projects in the vicinity of the Kirkland Nickel Project that connect to I-405.

The Sound Transit Totem Lake Freeway Station/NE 128th Street Project will provide more direct transit access to the Kingsgate Park-and-Ride and the proposed Totem Lake Transit Center on the Evergreen Hospital campus. It will also improve regional connections and access to local services.

The project calls for constructing a new bridge over I-405 at NE 128th Street and direct-access ramps connecting the HOV lanes on I-405 with the new crossing. The crossing includes a five-lane structure for general-purpose traffic. The existing freeway transit flyer stops, located at NE 132nd Street and I-405, will be relocated onto the new direct-access ramps, which will be restricted to buses and carpools. A pedestrian walkway will connect the Kingsgate Park-and-Ride lot with the new passenger shelters located on the direct-access ramps. The pedestrian walkway will be covered for most of its length. Construction is expected to start in 2005 and end in May 2007.

The City of Kirkland NE 128th Street Roadway Improvement Project includes reconstructing the roadway and drainage system on NE 128th Street from 120th Avenue NE to the eastern limit of the Sound Transit Totem Lake Freeway Station Project. Northeast 128th Street will be widened to two lanes in each direction with parking on the north side and bike lanes, sidewalks, and landscaping on the north and south sides. Construction is expected to be completed during 2005.

The City of Kirkland is planning to add a dual left-turn lane from 114th Avenue to eastbound NE 85th Street and an HOV priority lane on NE 85th Street. The HOV lane will start at Kirkland Way and extend east to connect with the HOV lane on-ramp to southbound I-405. Construction is planned for late 2005 and early 2006.

Runoff conveyed in the onsite bypass line would run down slope along the freeway alignment, and then to a Combined Stormwater Treatment Wetland/Detention Pond

facility at the bottom of the ravine. Construction of the treatment facility would require the purchase of a sparsely developed private residential parcel along Riverside Drive. Enhanced water quality treatment would be provided in the associated wetland. Runoff would discharge to an existing roadside ditch, which then discharges to an open channel flowing between private properties to the Sammamish River.

2.5 Project Measures to Avoid or Minimize Effects to the Environment

WSDOT has well-established design and construction practices for avoiding or minimizing impacts resulting from environmental conditions anticipated along the project alignment. The following sections describe the measures that WSDOT will include in the project to avoid or minimize impacts during construction and operation.

2.5.1 Project Measures to Avoid or Minimize Effects During Construction

Design elements such as boundaries of areas that can be impacted that have been incorporated into the project specifications, as well as construction plans and procedures, will avoid or minimize most potential construction impacts. When appropriate, monitoring will be conducted to ensure that these design and construction measures are effective.

Project Management

The contractor will demark environmentally sensitive areas, no-fill areas, and mitigation areas with fencing prior to beginning work in an area. The fencing is to remain in place throughout construction in the area. The contractor will also clearly delineate sensitive areas, fencing requirements, and permit conditions on plan sheets.

The contractor will assign an Environmental Inspector(s) trained in permitting requirements, water quality protection, wetland biology, and agency compliance procedures to project sites to ensure compliance with all permit conditions through construction completion and site stabilization.

The contractor will submit a detailed work plan to be approved by the WSDOT Project Engineer in consultation with the Environmental Inspector prior to the onset of any work in sensitive areas and mitigation sites.

WSDOT will develop and implement a commitment tracking system to identify all commitments made during planning, NEPA/SEPA, design, and permitting.

All project commitments are to be clearly communicated to the contractor, who will, in turn, communicate commitments to project office staff and supporting design offices.

Commitments and compliance activities will require regular communication, monitoring, and reports at regular intervals.

Monitoring and reporting will also be related to the contractor's schedule. Permit conditions and environmental commitments should be matched to critical construction activities that have a high risk for compliance issues. The activities should be tracked, monitored, and reported at the appropriate time back to resource agencies as: 1) complete without incident, 2) complete with resolved minor incident, 3) complete with non-compliance/violation.

The contractor will provide assurance that all environmental commitments have been achieved prior to the completion of construction and that WSDOT Maintenance and Operations have received and understand all long-term compliance expectations for the project site.

Measures for Geology, Soils, and Groundwater

Slope Stability and Landslide Areas

- A large landslide feature was identified at the northern end of the project. The design geotechnical investigation will fully examine this area and develop appropriate construction procedures to maintain or enhance slope stability.

- The contractor will be required to submit earthwork and wall placement sequencing plans, construction drainage plans, and a slope monitoring program.

- During construction, areas of observed or suspected groundwater seepage will be drained to reduce the risk of landslide and surface sloughing through the use of gravel drainage blankets, french drains, horizontal drains, and/or placement of a surface rock facing or similar methods.

Soft Ground Areas

- During the design process, geotechnical engineers will assess potential settlement problems associated with existing utilities or structures. If deemed necessary, structures could be underpinned and utilities relocated or made more flexible. In cases where it is an acceptable solution, the settlement will be allowed, with repairs made after settlement is complete. Where soft ground areas are identified, project engineers will conduct pre-construction surveys and monitor construction settlements.

- Construction vibration, particularly generated by driven pile installation (if allowed by resource agencies), large diameter drilled pier installation, and any required ground improvement, can cause settlement of adjacent areas underlain by loose granular soils. Project engineers will identify these areas during the design phase. The contractor will be required to develop the means and methods to avoid or minimize settlement.

Erosion

- The contractor will be required to prepare and implement a temporary erosion and sedimentation control (TESC) plan.

- Should any BMP or other operation not function as intended, the contractor will take additional action to minimize erosion, maintain water quality, and achieve the intended environmental performance.

Groundwater

- Groundwater will be protected with the use of standard BMPs for construction activities.

- A temporary erosion and sedimentation control (TESC) plan and a spill prevention and countermeasures (SPCC) plan will be established for all construction activities along the Kirkland Nickel Project alignment.

- The contractor will be required to take added measures during construction within the Kirkland Well Field's Wellhead Protection Area to protect the area, such as prohibiting fuel and chemical storage and refueling operations. Also, construction specifications will require stormwater collection with either a lined or piped conveyance system within the Wellhead Protection Area. Stormwater will be directed and discharged outside of the Kirkland Wellhead Protection Area to prevent any possible degradation of water quality of these wells. No permanent stormwater facilities will be constructed in the Kirkland Wellhead Protection Area.

Measures for Surface Water and Floodplains

Construction Runoff Management

- Prior to construction, a NPDES Stormwater Construction Permit covering activity in the highway right-of-way will be obtained from the Washington State Department of Ecology (Ecology).

- WSDOT will obtain a Hydraulic Project Approval from the Washington Department of Fish and Wildlife prior to construction.

- For work within waters of the United States (such as stream crossings), WSDOT will obtain a Section 404 permit from the US Army Corps of Engineers for discharging, dredging, or placing fill materials within waters of the US, including wetlands.

Measures for Water Quality

Spill Prevention Control and Countermeasures Plan (SPCC)

- The contractor will identify and develop staging areas for equipment repair and maintenance away from all drainage courses. Washout from concrete trucks will not be dumped into storm drains or onto soil or pavement that carries stormwater runoff. Thinners and solvents will not be used to wash oil, grease, or similar substances from heavy machinery or machine parts. The contractor will be required to designate a washdown area for equipment and concrete trucks.

Measures for Wetlands

The following activities will be undertaken to avoid or minimize impacts to wetlands:

- WSDOT and the contractor will protect, preserve, and enhance wetlands in the project area during the planning, construction, and operation of transportation facilities and projects consistent with USDOT Order 5660.1A; Executive Order 11990.

- The project will follow guidance contained in the wetlands section of the WSDOT *Environmental Procedures Manual* (WSDOT, 2004a), which outlines the issues and actions to be addressed prior to authorizing work that could affect wetlands.

- The contractor will use fencing to clearly mark wetlands in the construction area that are to be avoided.

- Project-level design and environmental review has included avoidance, minimization, restoration, and compensation of wetlands. The contractor will implement these measures prior to adverse effects on wetlands, where feasible, to reduce temporal losses of wetland functions.

The Kirkland Nickel Project mitigation strategy includes the use of guidance by local governments to select projects that provide substantially greater functions and values than the wetland being affected. WSDOT has worked with the cities of Kirkland and Bothell, as well as King County to coordinate activities to minimize effects. Each project must satisfy the requirements of each jurisdiction to compensate for the respective loss of wetlands within the Kirkland Nickel Project area.

Despite WSDOT's efforts to avoid wetlands during the construction of the Kirkland Nickel Project, approximately 0.180 acres of wetlands will be temporarily disturbed; the contractor will be required to restore the temporarily disturbed wetlands. An additional area of approximately 1.6 acres of wetlands will be permanently lost. The acreage of lost wetlands is distributed among local jurisdictions accordingly:

- Kirkland – 1.229 acres

- Bothell - 0.136 acres

- Unincorporated King County - 0.235 acres

Three sites will be used to provide the required wetland mitigation according to replacement ratios of each jurisdiction to fully replace the lost wetlands. The sites selected for mitigation are:

- Property on the west side of Forbes Lake – After wetlands mitigation has been constructed and monitored, the private property will be deeded to the City of Kirkland.

- Property on the east side of Forbes Lake – WSDOT will use 4.5 acres of City of Kirkland property for mitigation.

- Property south of Thrashers Regional Park – WSDOT will acquire 4.7 acres of private property west of SR 527 (Bothell-Everett Highway) and north of 214th Street SE. After wetlands mitigation has been constructed and monitored, the acquired property will be deeded to the City of Bothell.

Measures for Wildlife and Upland Vegetation

- The contractor will be required to prepare and implement a revegetation plan that has been approved by WSDOT. In addition, areas with mixed forest will not be removed for temporary use (i.e., construction staging). Areas of mixed forest that will be permanently removed for roadway construction will be replaced with plantings of native tree and shrub species (acre for acre) within the affected area.

- The contractor will adhere to project conditions identified in the Biological Assessment and agency concurrence letters.

- Consistent with an agreement that WSDOT has made with USFWS, no more than 80 acres of vegetation will be removed and areas with mixed forest will not be removed for temporary use (i.e., staging). Areas of mixed forest that will be permanently removed will be replaced with plantings of native trees and shrub species (acre for acre) within the action area.

Measures for Fish and Aquatic Resources

The following measures will be followed to minimize or avoid effects to fish and aquatic resources during construction:

- The contractor will be required to implement construction BMPs (such as silt fencing or sedimentation ponds) and to avoid disturbing sensitive areas during the development and use of any staging areas, access roads, and turnouts associated with resurfacing activities.

- The contractor will not allow any in-water work to occur except during seasonal work windows established to protect fish.

- The fish-friendly culvert or bridge constructed at Forbes Creek will restore fish passage beneath the freeway. Approximately 7,500 linear feet of stream between the freeway and Forbes Lake will become available for fish use.

- If conditions allow, the contractor will use bio-engineering techniques at new stormwater outfalls near Yarrow Creek, Juanita Creek, Forbes Creek and the Sammamish River.

- New stormwater discharged to Forbes Creek will be conveyed to Forbes Creek via existing stormwater conveyances so no new outfalls (requiring grading or filling with bank-stabilizing or energy-dissipating riprap) will be constructed in Forbes Creek.

- If the width of the road prism[1] increases to accommodate the wider span of roadway at Forbes Creek and at Stream KL8, headwalls[2] will be constructed at the culvert inlet and outlet to minimize the amount of grading and filling.

- The detention pond on the west side of I-405 will be sited at a sufficient distance south of Forbes Creek so no grading or filling in Forbes Creek or its stream-side zone will be required.

- The combined stormwater treatment wetland/detention to be constructed near Riverside Drive will be sited at a sufficient distance from both the Sammamish River and the unnamed stream KL14 (at Riverside Drive) so no grading or filling in the streams or the stream-side zones will be required.

- The contractor will be required to compensate for tree and other vegetation eliminated by the removing invasive species and planting of cedar trees.

[1] The portion of the highway between the ditch lines, curb lines, or toe of fill lines.
[2] A concrete structure at the end of a culvert to protect the embankment slopes, anchor the culvert, and prevent undercutting.

- Short-term compensation for loss of large woody debris recruitment will include placing large woody debris in the stream.

- New stormwater conveyance system and associated outfall to Yarrow Creek will avoid the need for and use of riprap in Yarrow Creek for energy dissipation and bank stabilization, if conditions allow.

- The new fish passage culvert and associated fishway on Forbes Creek will use hard and soft engineering features likely to include riprap, headwalls or concrete fishway structures, integrated streambank protection techniques, channel grading, and landscaping and planting.

- Retaining walls (headwalls) will be constructed at culvert inlets and outlets to minimize the amount of grading and filling required if the road prism changes to accommodate the wider span of the roadway at all streams.

- Retaining walls (headwalls) will be constructed at culvert outlet to minimize the amount of grading and filling required if the road prism changes to accommodate the wider span of the roadway at Stream KL8.

- A retaining wall (headwall) will be constructed at culvert inlet and outlet to minimize the amount of grading and filling required if the road prism changes to accommodate the wider span of the roadway at Juanita Creek.

- The detention pond on the west side of I-405 near milepost 19.1 will be sited at a sufficient distance south of Forbes Creek so that no grading or filling in Forbes Creek or its riparian zone will be required as a result of its construction.

- The detention pond on the west side of I-405 near milepost 22.0 will be sited at a sufficient distance south of Juanita Creek so that no grading or filling in Juanita Creek or its riparian zone will be required as a result of its construction.

- The combined stormwater treatment wetland/detention to be constructed near Riverside Drive will be sited at a sufficient distance from unnamed stream KL14 (at Riverside Drive) so that no grading or filling in KL14 or its riparian zone will be required as a result of its construction.

- The combined stormwater treatment wetland/detention to be constructed near Riverside Drive will be sited at a sufficient distance from the Sammamish River so that no grading or filling in the river or its riparian zone or nearby wetlands will be required as a result of its construction.

Measures for Air Quality

Measures to reduce air quality emissions during construction were discussed in the I-405 Corridor EIS. The measures applicable to the Kirkland Nickel Project are summarized here.

- The contractor will prepare and implement a fugitive dust control plan in accordance with the Memorandum of Agreement between WSDOT and PSCAA Regarding Control of Fugitive Dust from Construction Projects (October 1999).

The following measures will be used to control dust (PM10), transmissions of particulate matter, and emissions of CO and NOx during construction:

- Exposed soil will be sprayed with water to reduce emissions of PM10 and deposition of particulate matter.
- Truck loads will be covered or materials in trucks will be wetted or provided adequate freeboard (space from the top of the material to the top of the truck) to reduce PM10 and deposition of particulates during transport.
- Wheel washers will be provided to remove particulate matter that would otherwise be carried off site by vehicles to decrease deposition of particulate matter on area roadways.
- Particulate matter deposited on public roads will be removed to reduce mud on area roadways.
- Dirt, gravel, and debris piles will be covered or wetted during periods of high wind when the stockpiles are not in use.
- Construction trucks will be routed and scheduled to reduce traffic delays during peak travel times to reduce secondary air quality impacts that result when vehicles slow down to wait for construction trucks.

Measures for Noise

To reduce construction noise at nearby receptors, the following measures will be incorporated into construction plans and specifications:

- Erecting noise berms and barriers prior to other construction activities to provide noise shielding.
- Limiting the noisiest construction activities, such as pile driving (if allowed by resource agencies) to between 7 AM and 10 PM to reduce construction noise levels during sensitive nighttime hours.
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures to reduce their noise by 5 to 10 dBA (US EPA, 1971).
- Turning off construction equipment during prolonged periods of nonuse to eliminate noise.
- Requiring contractors to maintain all equipment and train their equipment operators in good practices to reduce noise levels.
- Locating stationary equipment away from receiving properties to decrease noise.
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to residences, to decrease noise levels at nearby sensitive receptors.

- Requiring resilient bed liners in dump trucks to be loaded on site during nighttime hours.

- Requiring contractors to use OSHA-approved ambient sound-sensing backup alarms that could reduce disturbances from backup alarms during quieter periods.

New noise walls will be constructed at five locations provided that adjacent residents agree and that wall construction is feasible from an engineering perspective:

- Along the eastern edge of the I-405 right-of-way along the NE 160th Street northbound on-ramp to 118th Avenue NE. The noise wall (NW1) will be approximately 1,280 feet long and 20 feet high.

- Along the western edge of the I-405 right-of-way between NE 132nd Street and 113th Avenue NE. The noise wall (NW3) will be approximately 1,680 feet long and 18 feet high.

- Along the western edge of the I-405 right-of-way between the north end of the existing wall west of I-405 in the NE 95th Street vicinity and NE 100th Street. The noise wall (NW4) will be approximately 920 feet long and 16 feet high and have no gap between it and the existing noise wall.

- Along the eastern edge of the I-405 right-of-way between NE 80th Street and the off-ramp to NE 85th Street. The noise wall (NW7) will be approximately 735 feet long and 20 feet high.

- Along the eastern edge of the I-405 right-of-way between NE 60th Street and the existing noise wall south of NE 67th Place. The noise wall (NW8) will be approximately 500 feet long and 18 feet high and have no gaps between it and existing noise walls.

Noise walls will be relocated at:

- Along the western edge of the I-405 right-of-way between NE 144th Street and the vicinity of NE 149th Street. The noise wall (NW2) will be approximately 1,565 feet long and 16 feet high.

- Along the eastern edge of the I-405 right-of-way between the end of the northbound on-ramp at the NE 85th Street interchange and NE 97th Street. The noise wall (NW5) will be approximately 1,325 feet long and 16 feet high and have no gaps between it and the remaining existing noise wall.

- In the vicinity of NE 92nd Street on the west side of I-405 where the existing noise wall was constructed in a depression, the new section of noise wall (NW6) will be 390 feet long and 16 to 20 feet high.

- Along the western edge of the I-405 right-of-way between NE 53rd Street and NE 65th Street. The noise wall (NW9) will be approximately 700 feet long and 8 feet high and have no gaps between it and the remaining existing noise walls. The replacement wall will be situated closer to the right-of-way line.

Measures for Hazardous Materials

WSDOT will manage contaminated media and will provide guidance for managing contaminated media that may be encountered with the project right of way according to current rules and regulations.

Known or Suspected Contamination within the Project Right-of-Way

- WSDOT may be responsible for the remediation and monitoring of contaminated properties that will be acquired for this project. In such cases, WSDOT will further evaluate the identified properties to assess their condition before acquisition or construction occurs.

- Prior to construction, the contractor will have a thorough asbestos containing materials/lead based paint (ACM/LBP) building survey completed by a certified building inspector on all property structures that will be acquired and/or demolished.

- If WSDOT acquires a portion or all of a property (building, structure) suspected of containing ACM/LBP, the contractor will properly abate and dispose of any existing ACM and LBP contamination prior construction activities. Depending on the concentration of lead in the demolition debris, some debris may need to be disposed of as dangerous waste, which will require that Ecology be notified and that appropriate regulations are followed.

- If the contractor encounters an underground storage tank (UST) within its right-of-way, WSDOT will assume cleanup liability for the appropriate decommissioning and removal of USTs. If this occurs, WSDOT and the contractor will follow all applicable rules and regulations associated with UST removal activities.

- Construction waste material such as concrete or other deleterious materials' disposal/treatment will take place at approved sites.

- WSDOT may acquire the responsibility for cleanup of any soil or groundwater contamination encountered during construction within WSDOT right-of-way or staging areas. Contaminated media will be evaluated relative to MTCA cleanup levels.

- The contractor will be required to meet all regulatory conditions imposed at contaminated properties (e.g., Consent Decree) associated with construction. These conditions could include ensuring that the surrounding properties and population are not exposed to the contaminants on the site; i.e., the contractor will ensure that the site is properly contained after construction is completed so that contaminants do not migrate offsite and so that the health and safety of all on-site personnel are protected during work at the site. WSDOT may also assume responsibility for ongoing groundwater monitoring of any existing wells within the planned right-of-way.

- WSDOT will consider entering into a pre-purchaser's agreement for the purposes of indemnifying WSDOT against acquiring the responsibility for any long-term cleanup and monitoring costs.

Known or Suspected Contamination Outside of the Project Right-of-Way

- Contaminated groundwater originating from properties located up-gradient of the right-of-way could migrate to the project area. WSDOT generally will not incur liability for groundwater contamination that has migrated into the project footprint as long as the agency does not acquire the source of the contamination. However, the contractor will manage the contaminated media in accordance with all applicable rules and regulations.

Unknown Contamination

- If WSDOT acquires a property that has unknown contamination, the agency could incur liability for any contamination discovered after acquisition, as well as liability for the removal of any stored materials remaining onsite at the time of the acquisition. WSDOT could be responsible for cleanup or disposal of these unknown substances, for example, USTs and contaminated media (including ACM and LBP). If unknown contamination is discovered during construction, the contractor will follow the SPCC Plan as well as all appropriate regulations.

Worker and Public Health and Safety

The contractor will comply with the following regulations and agreements:

- State Dangerous Waste Regulations (Chapter 173-303 WAC)
- Safety Standards for Construction Work (Chapter 296-155 WAC)
- National Emission Standards for Hazardous Air Pollutants (NESHAP) (Code of Federal Regulations, Title 40, Volume 5, Parts 61 to 71)
- General Occupational Health Standards (Chapter 296-62 WAC)
- Implementing Agreement between Ecology and WSDOT Concerning Hazardous Waste Management (April 1993)

Hazardous Materials Spills During Construction

- The contractor will prepare and implement a SPCC Plan will be implemented to minimize effects on soil, surface water, and groundwater as described above in Water Quality.

Measures for Traffic and Transportation

The contractor will prepare a traffic management plan prior to making any changes to the traffic flow. The public, school districts, and emergency service providers will be informed of the changes ahead of time through a public information process.

- Prior to and during construction, WSDOT will implement strategies to manage the demand on transportation infrastructure. These Transportation Demand Management (TDM) strategies will form an important part of the construction management program and will be aimed at increasing public awareness and participation in HOV travel. The major focus will be on expanding vanpooling and vanshare opportunities.

Measures for Visual Quality

The contractor will follow the I-405 Context Sensitive Solutions (CSS) criteria being developed. Where the local terrain and placement of light poles allow, the contractor will reduce light and glare effects by shielding roadway lighting and using downcast lighting so light sources will not be directly visible from residential areas and local streets.

The contractor will restore (revegetate) construction areas in phases as the project is completed.

Measures for Social Elements

The following measures will be used during construction:

- The contractor will be required to prepare and implement a traffic management plan (TMP). Detour routes will be signed if periods of closure are needed.
- The contractor will coordinate with the school districts before construction. The TMP will be implemented and coordinated with all emergency services organizations prior to any construction activity.
- The contractor will coordinate with utility providers prior to construction to identify conflicts and resolve the conflicts prior to or during construction.

Measures for Economics

Construction Interference

- The contractor will maintain access to businesses throughout the construction period.
- Because it can be difficult to determine whether a business is open, or how to access the site during the construction period, the contractor will make provisions for posting appropriate signs to communicate the necessary information to potential customers.
- The contractor will keep daytime street closures to a minimum.

Displacements

- In those situations where it is necessary to acquire property, WSDOT will conform to the requirements set forth in the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and implemented by FHWA under 49 CFR, Part 24, and according to Chapter 468-100 WAC Uniform Relocation and Assistance and Real Property Acquisition to ensure just compensation of all properties and minimal effect on the current owners and residents. Relocation resources are available, without discrimination, to all eligible residential and business relocates.
- WSDOT will prepare a relocation plan in advance of actual displacements. Additional information will be collected, possibly through property owner interviews, to identify the specific needs of any business that will be relocated.

Measures for Public Services and Utilities

WSDOT will coordinate several efforts with the contractor prior to and during construction of the project. These efforts will ensure that:

- The contractor will prepare and implement a Traffic Management Plan (TMP). Signs will be posted to show detour routes if periods of closure are needed.
- Coordination with the school districts will occur before construction. The TMP will be implemented and coordinated with all emergency services providers prior to any construction activity.
- Coordination with utility service providers will identify conflicts and resolve them prior to or during construction.
- Prior to removal of the park-and-ride facility at NE 116th Street and 112th Avenue NE, signs will be posted at the lot to announce closure, and the location of nearby lots will be identified.
- Potential utility conflicts within WSDOT right of way will have been relocated at the utility's expense prior to contract award.

Measures for Historic, Cultural, and Archaeological Resources

WSDOT will prepare an unanticipated discovery plan (UDP) for the project that will be followed by the contractor. Since there are no historic, cultural or archaeological resources in the construction area, additional measures are not required.

2.5.2 Project Measures to Avoid or Minimize Effects During Operation

WSDOT has well-established design, operational, and maintenance practices for managing long-term operation issues associated with the types of soil, geologic, and groundwater conditions anticipated along the project alignment. The following sections describe the measures that WSDOT will implement during operation.

Measures for Geology, Soils, and Groundwater

Erosion

- A stormwater pollution prevention plan for operational activities will document drainage facilities and specify their inspection, operation, and maintenance requirements.

Groundwater

- The SPCC plan will address the long-term operational phases of the project. Permanent stormwater collection, conveyance, and discharge systems will capture and control spills and prevent contamination of the groundwater aquifers.

Measures for Water Quality

- Permanent controls for the mitigation or containment of spills will be provided for new pavement (or equivalent pavement areas) within the project area. Stormwater treatment facilities for flow control and water quality runoff treatment

will provide successive levels of protection for downstream conveyance systems by intercepting and retaining spilled contaminants. Subsequent maintenance activities would remove the contaminants from the treatment facilities and restore normal operation to the system.

- Scheduled maintenance programs developed for the stormwater treatment system will include provisions for the regular removal of contaminants and restoration of treatment operations.

- Oil and other petroleum products will be removed with oil treatment facilities.

Measures for Fish and Aquatic Resources

The following measures will be used to avoid or minimize impacts to fish and aquatic resources during operation of the project:

- Stormwater will be controlled so that peak and base flows in Yarrow Creek are not adversely affected by discharge of treated stormwater from the greater impervious surface areas that will be created north of Yarrow Creek.

- Stormwater will be controlled so that peak and base flows in Forbes Creek are not adversely affected by discharge of treated stormwater from the greater impervious surface areas that will be created in the vicinity of Forbes Creek and subsequently discharged to it through an existing conveyance system.

- Stormwater will be controlled so that peak and base flows in Forbes Creek (to which KL8 is a tributary) are not adversely affected by discharge of treated stormwater from the greater impervious surface areas that will be created in the vicinity of unnamed stream KL8.

- Stormwater will be controlled so that peak and base flows in the Sammamish River are not adversely affected by discharge of treated stormwater from the greater impervious surface areas that will be created in the vicinity of unnamed stream KL14 and subsequently discharged to the Sammamish River.

- Off-site flow will continue to contribute flow to unnamed stream KL14 so that peak and base flows are not adversely affected by new stormwater treatment and detention facilities in the vicinity of this stream.

- Ongoing maintenance of stormwater treatment and detention facilities will not include the application of any chemical weed control agents (e.g., herbicides)

3.0 Methodology

Regional and secondary air quality impact analyses were completed for the I-405 Corridor Program, including the Kirkland Nickel Project, as part of the *programmatic EIS Air Quality Review*.

3.1 Regional Analysis

The regional analysis of air quality impacts evaluated in the *programmatic EIS Air Quality Review* (WSDOT, 2001) includes the effects of construction in the Kirkland Nickel Project area as part of the implementation of the I-405 Corridor Program. The *programmatic EIS Air Quality Review* is incorporated by reference into this report. The regional effects have not changed substantially since that analysis; therefore, they are not repeated in this study. The PSRC determines regional conformity by including a project in the Metropolitan Transportation Plan (MTP) and the Transportation Improvement Plan (TIP). The Corridor Program Selected Alternative was found to conform to the Puget Sound regional air quality maintenance plan.

For the *programmatic EIS Air Quality Review,* outputs from the transportation network model, including link volumes, speeds, and travel distances, were processed using the methodology and programs developed by PSRC to determine regional conformity. Emissions per mile traveled for CO, HC, and NO_x were calculated for the average speed of each scenario using the Puget Sound Regional Council (PSRC) input files to the Mobile5a emissions model.

3.2 Local (Project-Level) Analysis

The project team calculated carbon monoxide (CO) peak-hour concentrations in parts per million (ppm) using the p.m. peak-hour traffic volumes using Mobile 6.2 emission factors and Cal3QHC software. The following scenarios were modeled for the intersections within the project area most likely to exceed the NAAQS for CO as a result of the project:

- Existing year 2002
- No Build Alternative 2014 year of opening
- No Build Alternative 2030 design year
- Build Alternative year 2014 year of opening (Nickel Project only)
- Build Alternative 2030 design year (Nickel Project only)

3.2.1 Air Quality Analysis Locations

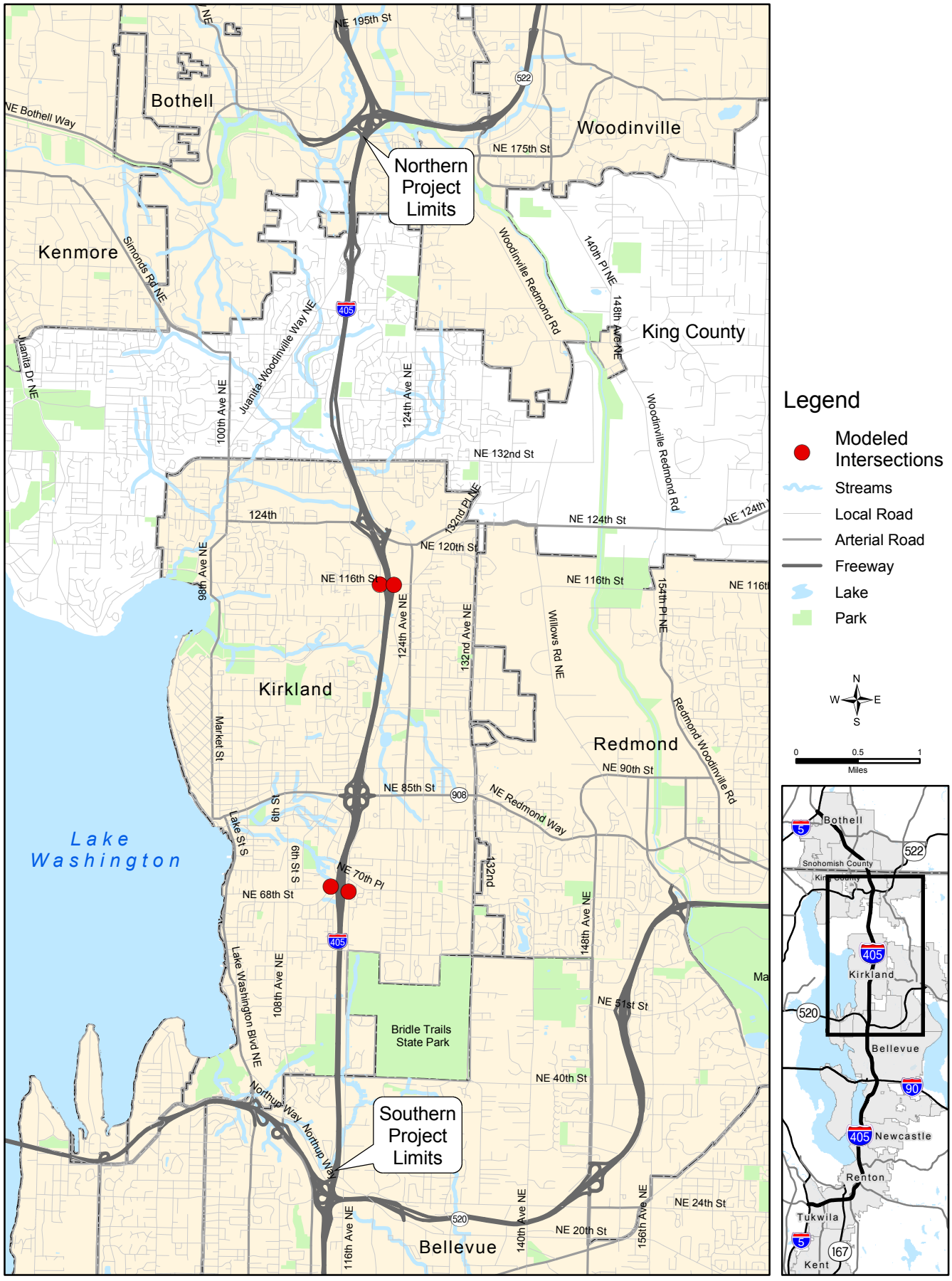
To select sites for analysis, year 2030 traffic volumes and levels of service (LOS) for all interchange intersections within the project corridor were evaluated and ranked as potential air quality analysis sites (see Table 3-1). The 2030 condition was used for intersection screening because traffic volumes would be highest in that year. The sites where air quality levels were most likely to be substantially increased by the project alternatives were selected for analysis following accepted Puget Sound Regional Council (PSRC) Conformity Evaluation Procedure for Intersection Projects.

Per the PSRC procedure, the three interchange ramp terminal intersections with the highest volume and LOS D, E or F were selected for intersection-level modeling. The

three intersections with the highest delay for each alternative were also selected for detailed (intersection-level) analysis. Four intersections in total were selected for intersection-level modeling (two of the four intersections were ranked highest for both volume and delay). Average delay defines the LOS of an intersection as shown in Table 3-2.The intersections selected for intersection-level CO modeling are shown in Figure 7. The four intersections selected were the I-405 southbound on- and off-ramps at NE 70th Street, the I-405 northbound on- and off-ramps to 70th Street at 116th Avenue NE, NE 116th Street at 120th Avenue NE, and NE 116th Street at 124th Avenue NE.

Table 3-1: Summary of Intersection Traffic Operations

Intersection	Volume	Delay	LOS
NE 124th Street & NB Ramps	4980	10	A
NE 85th Street & NB On-Ramp	4920	Unsignalized	A
NE 85th Street & SB On-Ramp	4800	Unsignalized	A
NE 85th Street & NB Off-Ramp	4800	Unsignalized	A
NE 8th Street & SB Off-Ramp	4760	Unsignalized	A
NE 124th Street & NB On-Ramp	4650	Unsignalized	A
NE 116th Street & 120th Avenue NE	4181	41	D
NE 116th Street & 124th Avenue NE	4090	81	F
NB I-405 Off-Ramp & NE 160th Street	4060	10	A
SB I-405 Off-Ramp & NE 160th Street	3871	16	B
NE 116th Street & SB On-Ramp	3390	Unsignalized	A
NE 124th Street & I-405 SB Off-Ramp	3379	12	B
NE 116th Street & I-405 NB/SB Ramps	3010	26	C
NB Ramps & 116th Avenue NE	2881	67	E
SB Ramps & NE 70th St	2620	42	D
NE 116th Street & NB Off-Ramp	2610	Unsignalized	A
NE 128th Street & HOV Ramps	1990	17	B
NB On-Ramp & NB Ramps	1550	Unsignalized	A
NE 116th Street & SB On-Ramp	1280	Unsignalized	A
NE 116th Street & NB Off-Ramp	1120	Unsignalized	A



Source: WSDOT; 2004, HDR; 2004 | \\SEAW405\405gis\project\map_docs\Kirkland\air quality\Modeled_intersections.mxd | Last Updated : 12-17-04

Intersections Modeled for CO Impacts

FIGURE 7

Table 3-2: Definition of Level of Service (LOS)

LOS	Control Delay Per Vehicle (Seconds)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

£ Less than or equal to

> Greater than

Source: Table 6-3, Level of Service from Control Delay (2000 Highway Capacity Manual)

3.2.2 Mobile 6.2 Emissions Modeling

Pollutant emissions from motor vehicles are affected by many factors, including travel speed, temperature, operating mode, and the age, type, and condition of the vehicle. New technologies are being implemented to reduce emissions in newer vehicles compared to prior models. Emission models calculate emission factors for average vehicles (which is a composite of automobiles, light trucks, heavy trucks, sport-utility vehicles [SUVs], etc.) operating under specific parameters, such as speed, vehicle age, and local emission control requirements.

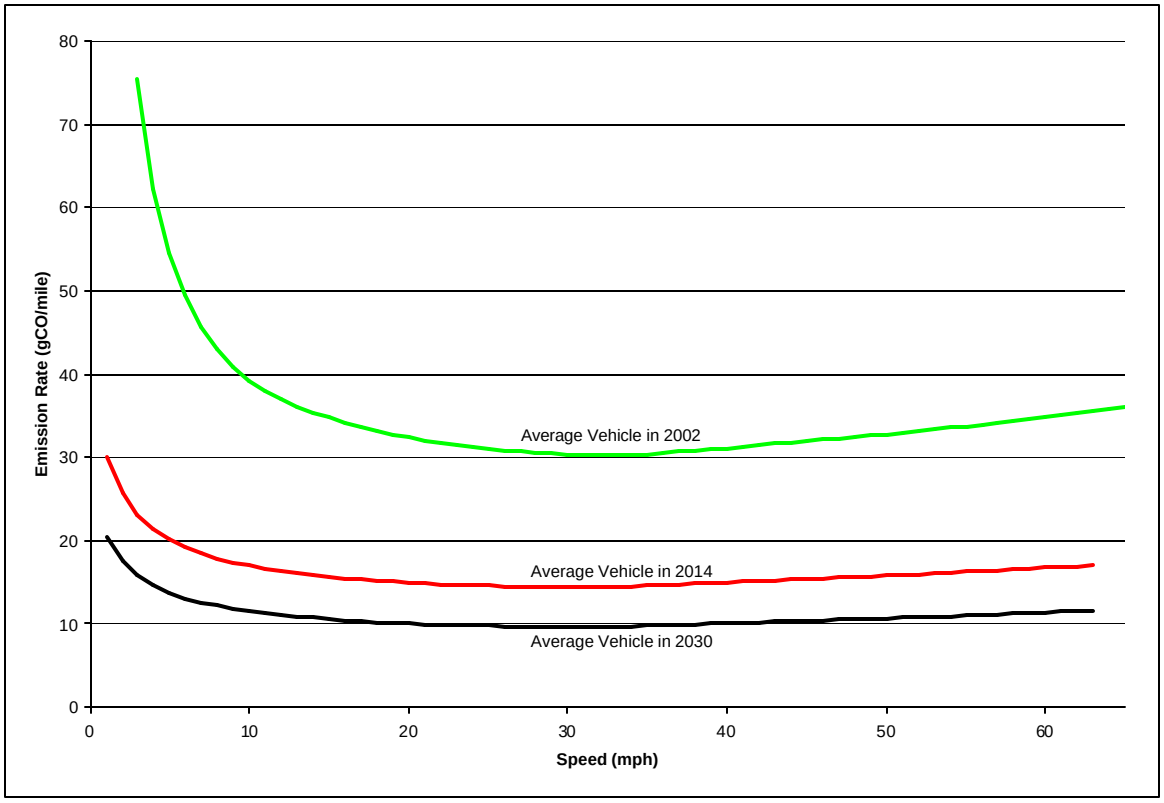
Air quality pollutant emission factors were estimated using the EPA MOBILE 6.2 emission factor program. The data inputs provided by the PSRC are based on implementation of the Washington State enhanced inspection and maintenance (I&M) and anti-tampering programs, which require annual inspection of automobiles and light trucks to determine if CO and HC emissions from the vehicles' exhaust systems are below strict emission standards. Vehicles failing the emissions test must undergo maintenance and pass a retest or receive a waiver to be registered in the state of Washington. Figure 8 shows emission factors for CO from an average vehicle traveling on an arterial in the Puget Sound region in 2002, 2014, and 2030. Decreases in emissions occur over time as a result of the gradual replacement of older vehicles with newer, less-polluting vehicles. Overall transportation-pollutant related air quality has been improving in the Puget Sound Region because of this reduction in emissions over time.

3.2.3 Cal3QCH Dispersion Modeling

Mobile source dispersion models are the basic analytical tools used to estimate pollutant concentrations expected under given conditions of traffic, roadway geometry, and meteorology.

Cal3QHC Version 2 is a line-source dispersion model that predicts pollutant concentrations, averaged over a one-hour period, near congested intersections and heavily traveled roadways. Cal3QHC input variables include free flow and idle emission

Figure 8. CO Emission Factors for Puget Sound Traffic



rates, roadway geometries, traffic volumes, site characteristics, background pollutant concentrations, signal timing, and meteorological conditions. Cal3QHC was used to predict CO concentrations at affected study-area intersections.

Different emission rates occur when vehicles are stopped (idling), accelerating, decelerating, and moving at different average speeds. Cal3QHC simplifies these different emission rates into the following two components:

- Emissions when vehicles are stopped (idling) during the red light phase of a signalized intersection
- Emissions when vehicles are in motion during the green light phase of a signalized intersection

Typical intersection geometry and receptor locations used in the Cal3QHC model are illustrated in Figure 9.

Cal3QHC predicts peak one-hour pollutant concentrations based on stable meteorology and peak-hour traffic flow. This study assumed a wind speed of 1 meter (3 feet) per second and evaluated wind directions in 10-degree increments to select the worst-case wind angle. Background CO concentrations were assumed to be 3 ppm, averaged over one hour to represent the conditions in the Puget Sound region (Ecology, 1995). An atmospheric stability class of D (urban land use) was modeled per EPA Guidance (EPA, 1992b and 1995a and 1995b). These conditions usually do not persist for an eight-hour period. Therefore, the worst-case eight-hour CO concentrations are lower than the maximum one-hour concentrations. The eight-hour average CO concentration is calculated by multiplying the maximum one-hour concentration by a persistence factor, which accounts for the time variance in traffic and meteorological conditions. The EPA recommended persistence factor of 0.7 (EPA, 1992b) was used.

Through traffic was modeled at the posted speed limit. Traffic volumes and traffic operations data, including turn movements, signal times, and saturation flow rates were taken from the Syncro runs that were completed as part of the transportation study. Lane widths of 12 feet (and 8- to 10-foot shoulders) were used to model most intersections, with some variances due to project design constraints. Existing and future intersection channelization was modeled to reflect the intersection configurations evaluated in the *Kirkland Nickel Project Transportation Discipline Report* (see Figures 10 and 11).

Specific locations where CO concentrations are predicted are known as *receptors*. Receptors are modeled for locations where maximum concentrations would likely occur because of traffic congestion, and where the general public would have access (EPA, 1992b). For this analysis, receptors were located in areas accessible to the general public at mid-sidewalk distance from the edge of the travel lane and 6 feet off the ground. Individual receptors were modeled at the corners of each intersection and at 75-foot intervals to a distance of 500 feet from the intersection. Only the highest CO concentration at each intersection was reported for each modeled scenario.

3.3 Construction Air Pollutant Emissions Analysis

The discussion of Kirkland Nickel Project construction phase air pollutant emission effects in this report summarizes the findings of the *programmatic EIS Air Quality Review.*

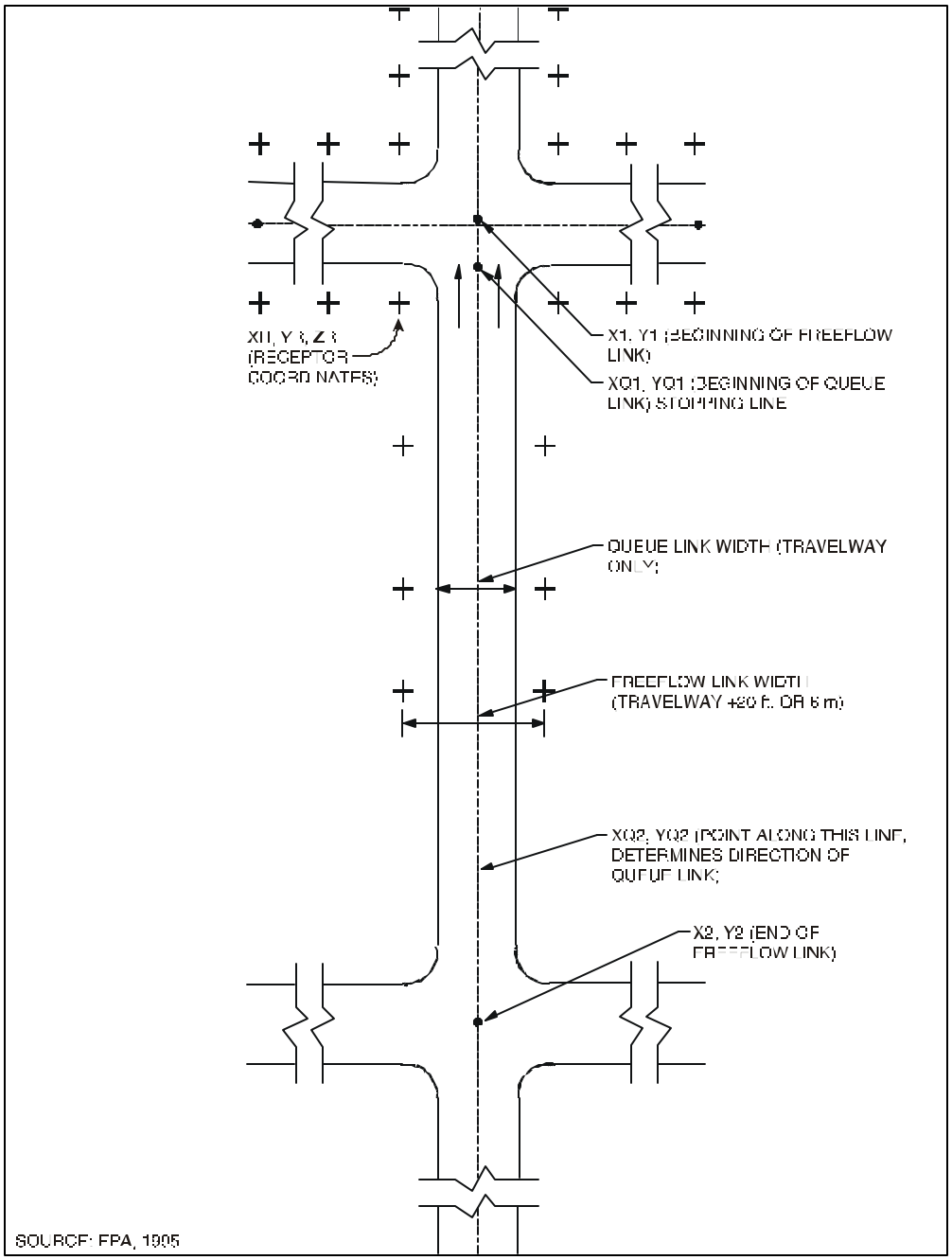
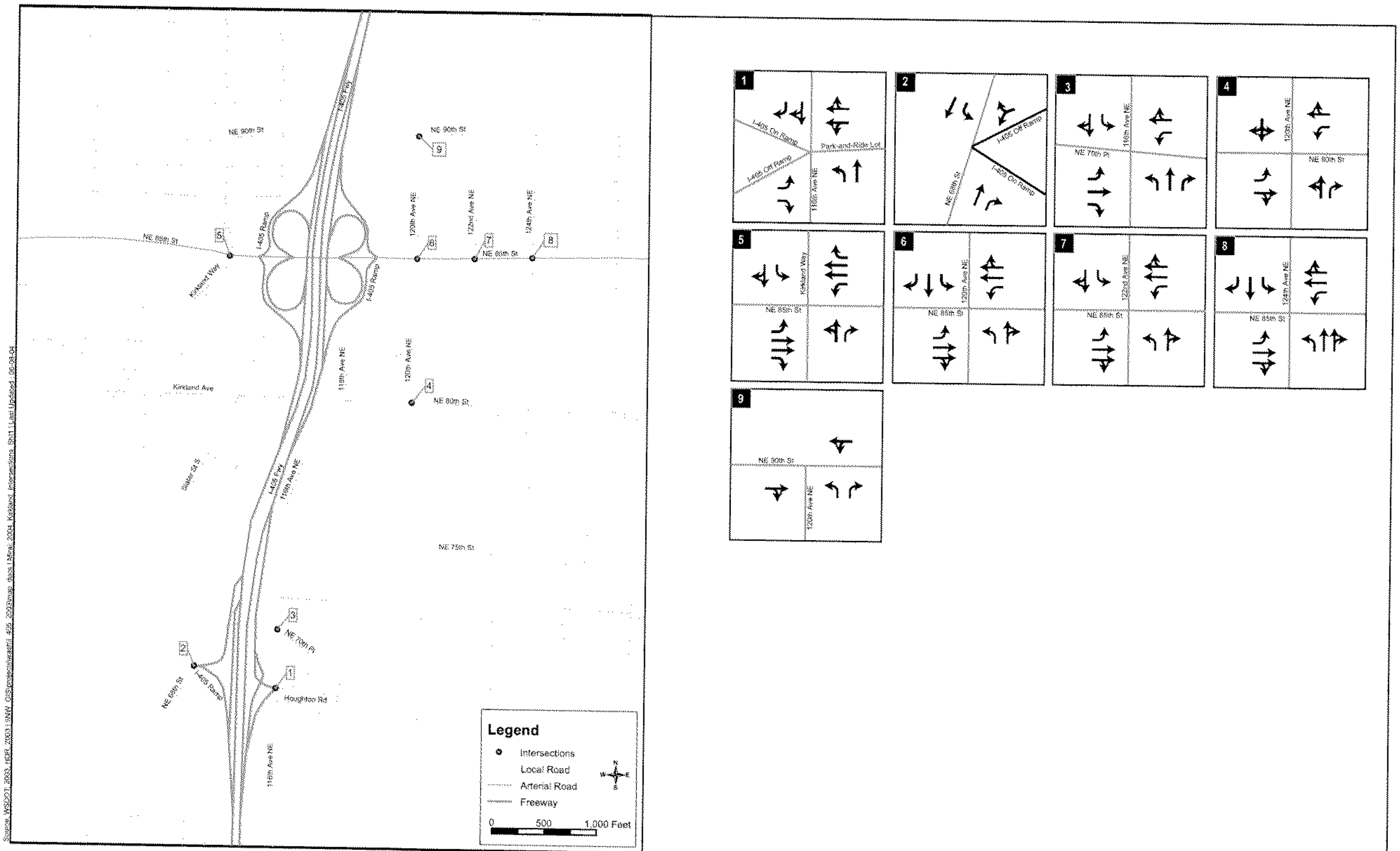


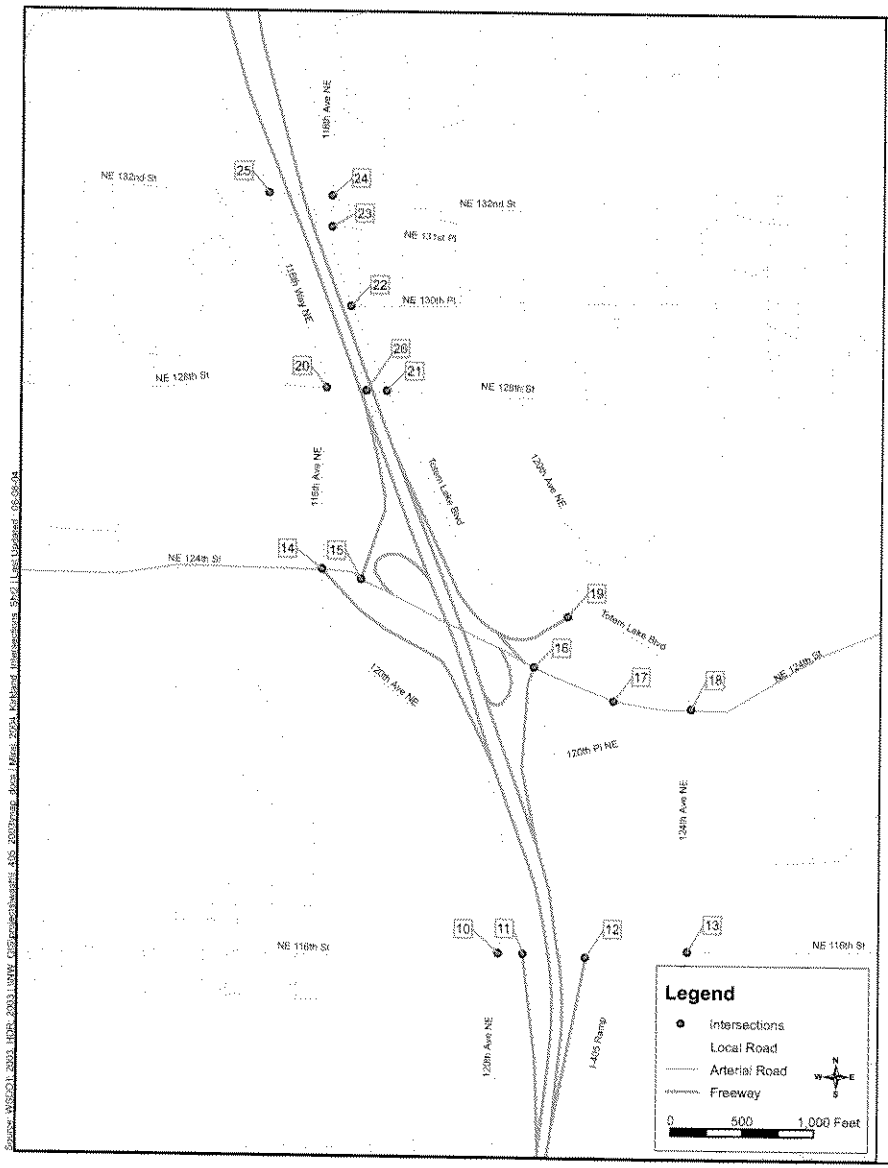
Figure 9. Typical Cal3QHC Intersection and Receptor Geometry

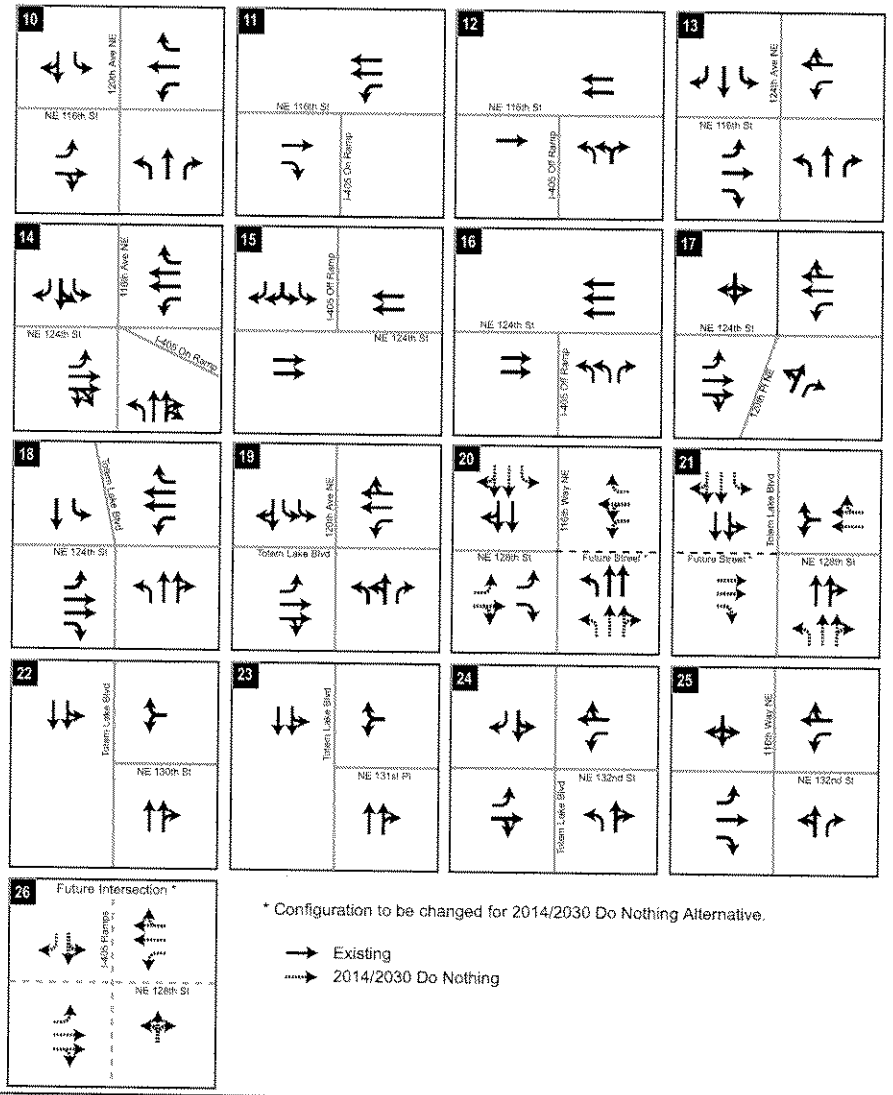


Arterial Intersection Geometry - Existing

FIGURE 10 | SHEET 1 of 3

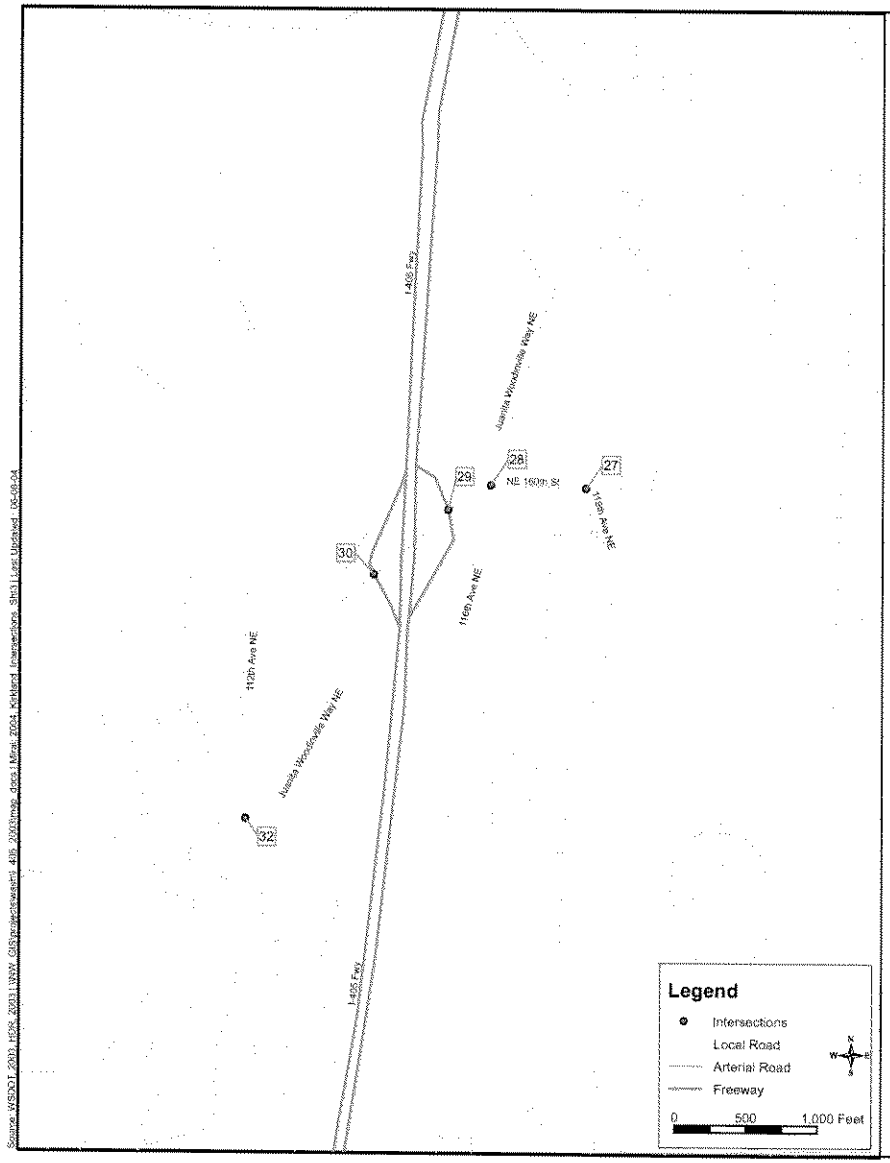
Source: WSDOT 2003, HDR 2003 | ... Kirkland Intersections Sht1 | Last Updated: 06-08-04

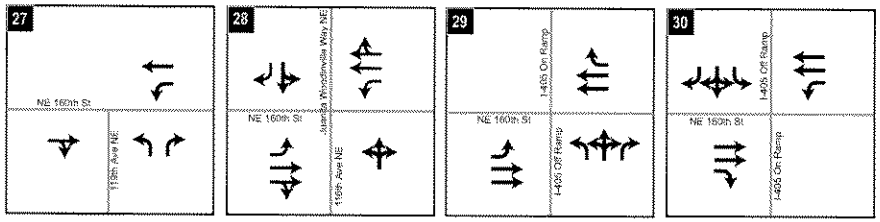




Arterial Intersection Geometry - Existing

FIGURE 10 | SHEET 2 of 3

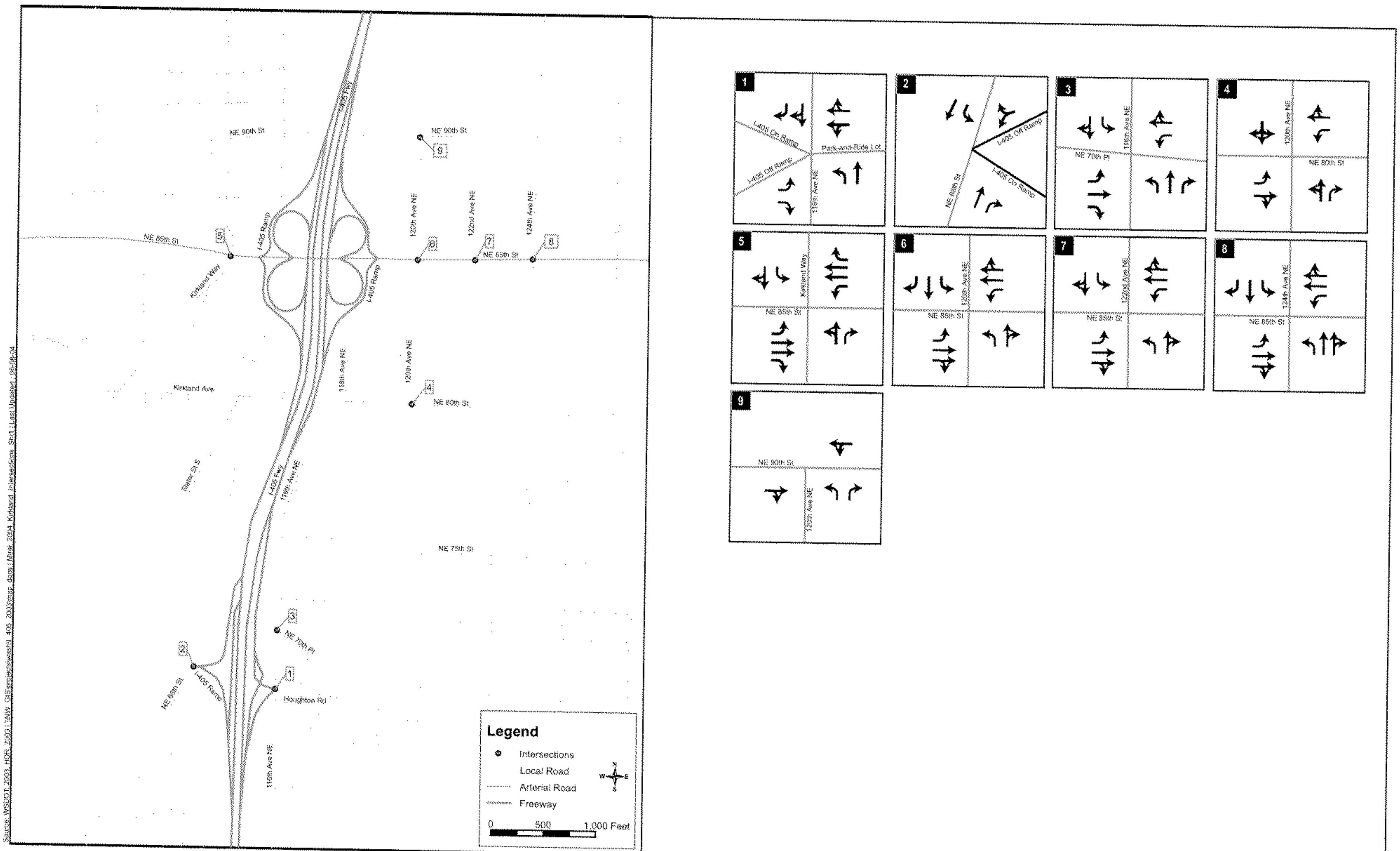




Source: WSDOT 2003 HSR 2003 | WW GIS\projects\sea\I_405_2003\map_docs | Mxd: 2004_Kirkland_Intersections_Sht3 | Last Updated: 05-09-04

Arterial Intersection Geometry - Existing

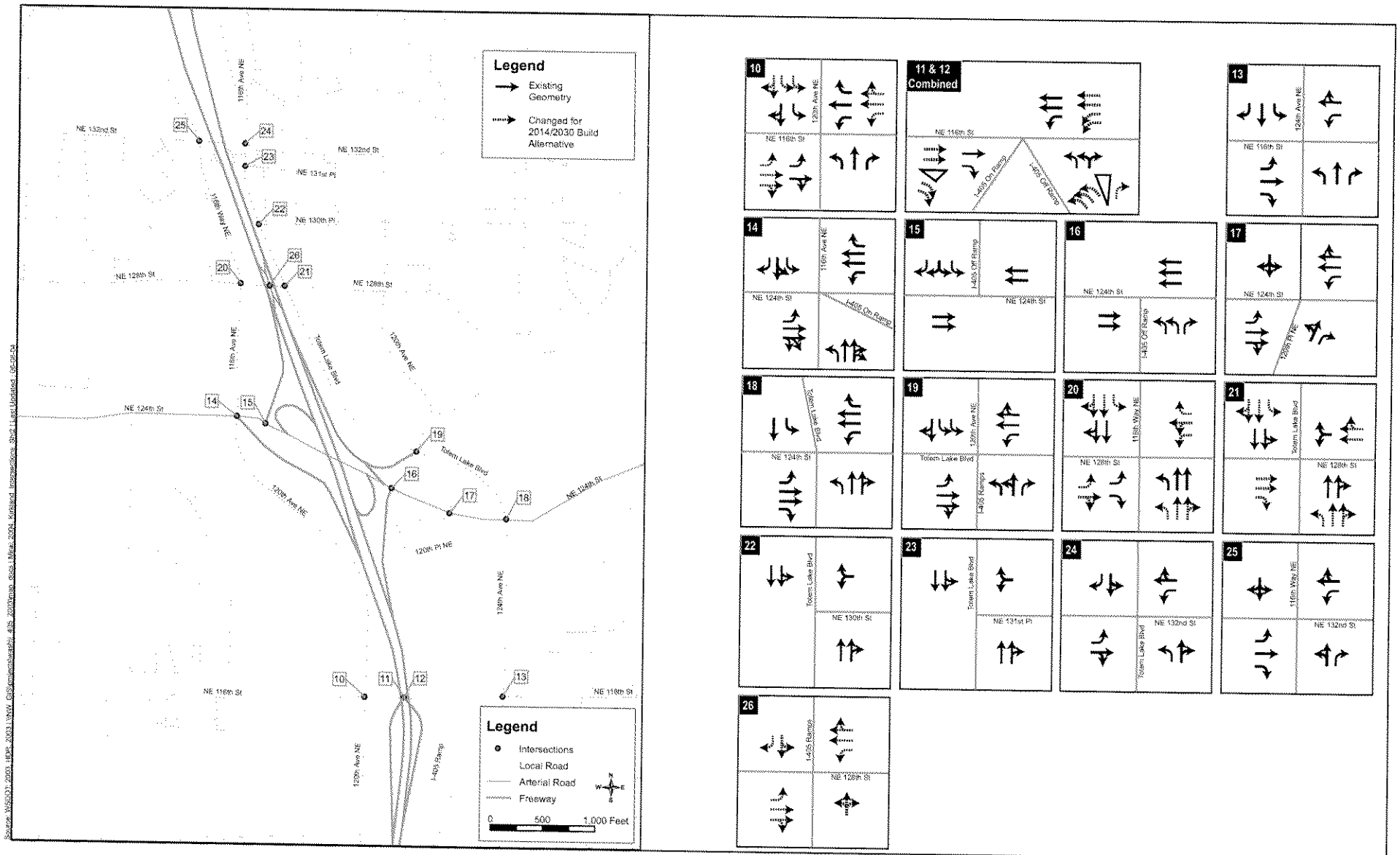
FIGURE 10 | SHEET 3 of 3



Source: WSDOT 2003, HDR 2003 | NW GIS\projects\wsnl 405 2003\map_docs\Mxd_2004_Kirkland_Intersections_Sht1 | Last Updated: 06-08-04

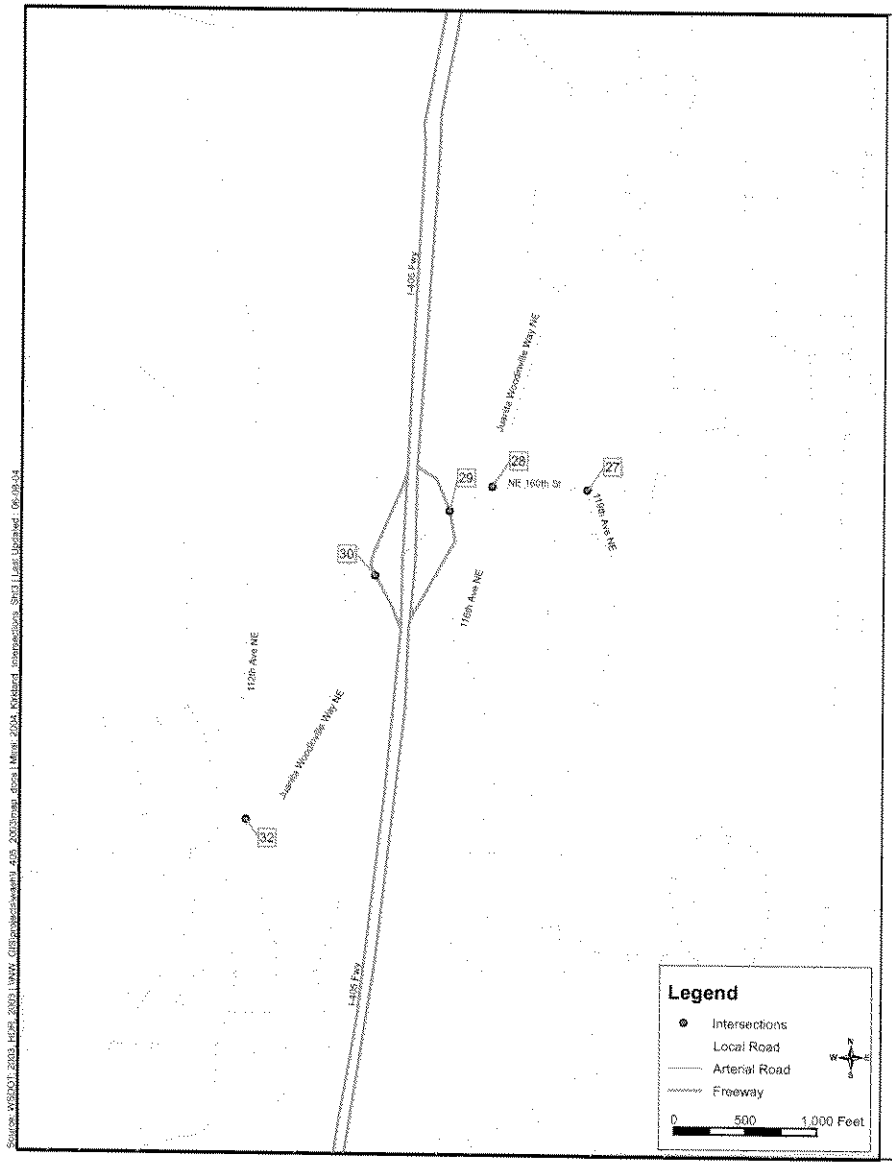
Arterial Intersection Geometry - 2014 and 2030 Build

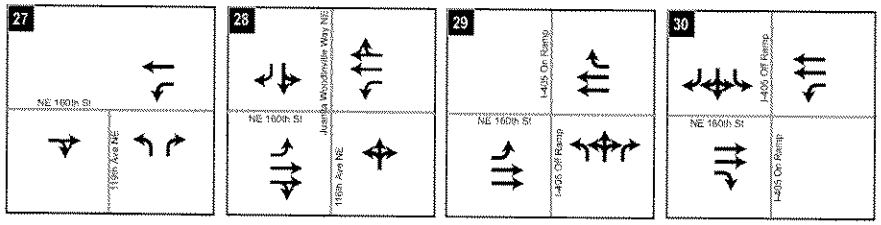
FIGURE 11 | SHEET 1 of 3



Arterial Intersection Geometry - 2014 and 2030 Build

FIGURE 11 | SHEET 2 of 3





Source: WSDOT, 2003 HSR, 2003 | Path: G:\Projects\wsdot\I-405_2003\Maps\Kirkland Intersections Shell | Last Updated: 06-09-04

Arterial Intersection Geometry - 2014 and 2030 Build

FIGURE 11 | SHEET 3 of 3

4.0 Affected Environment

Air quality in the project area has continued to improve since completion of the *programmatic EIS Air Quality Review*.

4.1 Regional Air Pollution Trends

Regional air pollutant trends have generally followed national patterns over the last 20 years. While the average weekday vehicle miles traveled in the central Puget Sound region has increased from 30 million miles in 1981 to 65 million in 1999 (PSRC 2000), pollutant emissions associated with transportation sources have decreased. Carbon monoxide is the criteria pollutant most closely tied to transportation, with over 90 percent of the CO emissions in the Puget Sound urban areas coming from transportation sources. Regionally, the maximum measured CO concentrations have decreased considerably over the past 20 years (see Figure 12). Other transportation-related pollutants have followed similar but less pronounced trends (see Figure 13).

4.2 Estimated Existing Air Pollutant Conditions

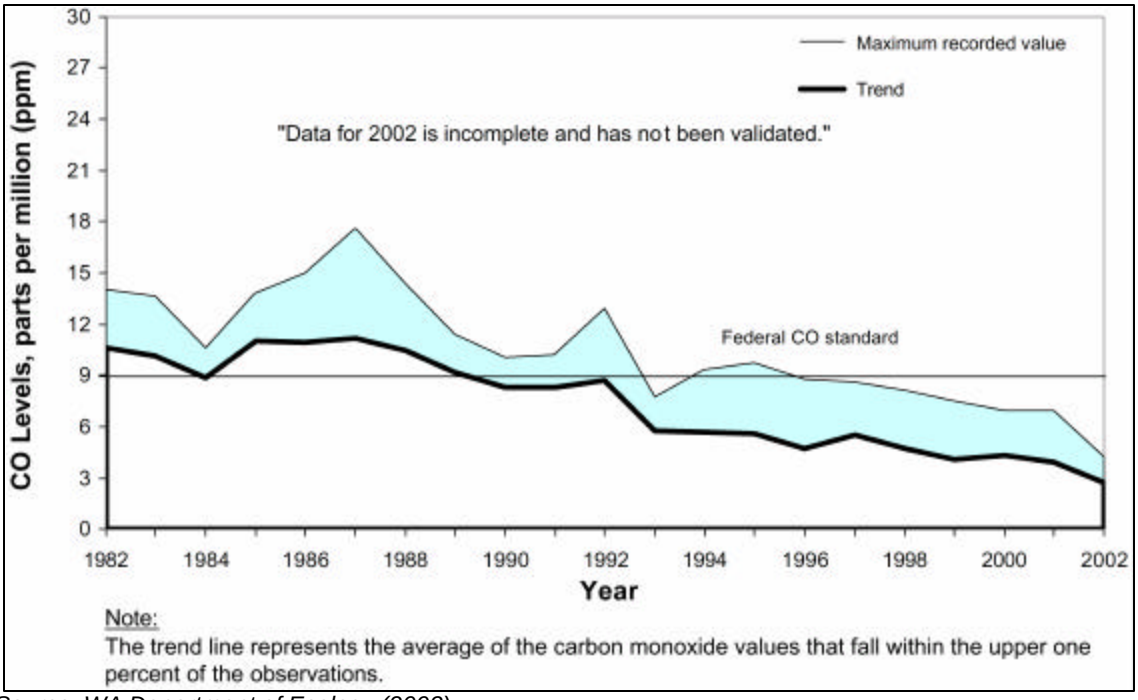
Worst-case CO concentrations were estimated for four intersections to evaluate the potential for exceedances of the NAAQS for CO (see Figure 7). The modeled intersections most likely to exceed the NAAQS for CO in the future with the Build Alternative are identified. Consistent methodology and assumptions were used for modeling existing and future conditions; therefore, modeled CO concentrations for 2002 can be compared with those predicted for future years to show the trend in air quality expected in the project area.

The maximum estimated one-hour CO concentrations from vehicle emissions for existing conditions range from 7.2 to 12.8 ppm, and the maximum estimated eight-hour CO concentrations range from 5.0 to 9.0 ppm (see Table 4-1). The modeling results showed no exceedance of the one-hour standard of 35 ppm for CO. Possible exceedance of the eight-hour average NAAQS for CO of 9 ppm was estimated at one intersection (NE 116th Street and 124th Avenue NE) under existing conditions in 2002. The estimated exceedance reflects conservative modeling assumptions, including peak-period traffic conditions, worst-case meteorological conditions, high background CO concentrations, and atmospheric stability that may not persist in the study area; therefore, the exceedance may never actually occur.

Table 4-1: Modeled Existing (2002) CO Concentrations

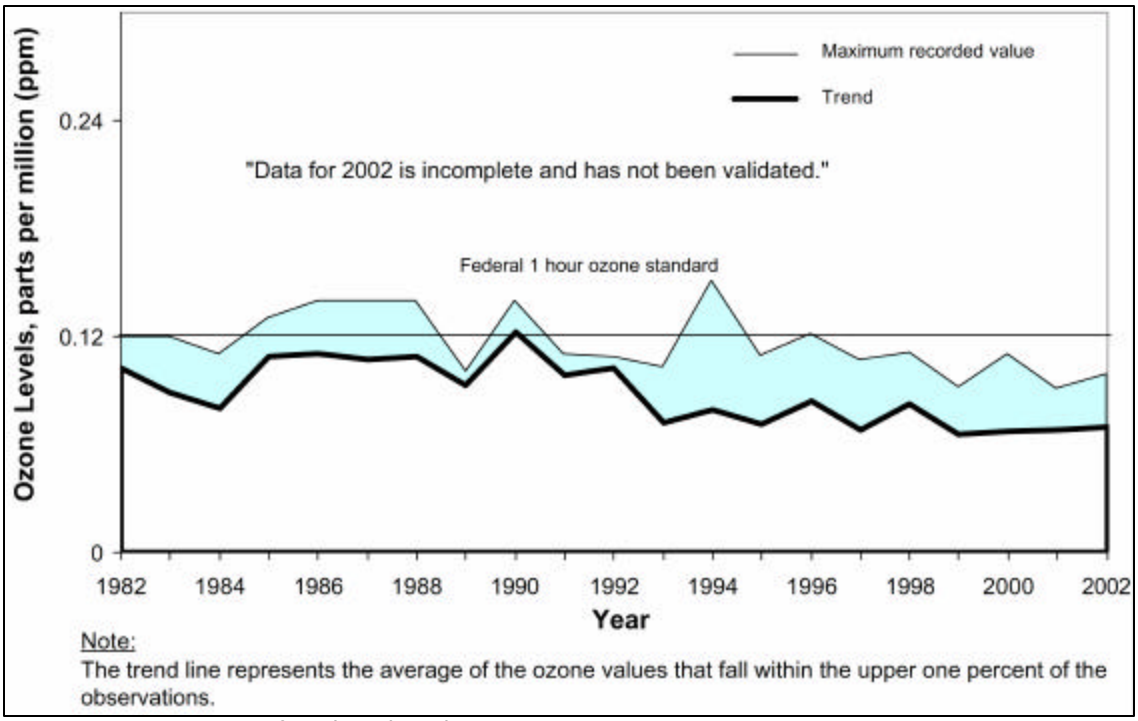
Intersection	One-hour Average CO Concentration*	Eight-hour Average CO Concentration*
I-405 SB on- and off-ramps and NE 70th Street	8.8	6.2
I-405 NB on- and off-ramps at NE 70th Street and 116th Avenue NE	7.2	5.0
NE 116th Street and 120th Avenue NE	8.7	6.1
NE 116th Street and 124th Avenue NE	12.8	9.0

**Concentration values are in parts per million (ppm).*
The one-hour NAAQS for CO is 35 ppm.
The eight-hour NAAQS for CO is 9 ppm.
EPA considers equalling the standard as exceeding the standard for transportation conformity modeling.



Source: WA Department of Ecology (2003).

Figure 12. Puget Sound CO Trend



Source: WA Department of Ecology (2003).

Figure 13. Puget Sound Ozone Trend

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5.0 Impacts

5.1 Build Alternative

Air pollutant emissions would occur during construction and operation of the proposed project. Air quality impacts evaluated in the *programmatic EIS Air Quality Review* include the effects of construction of the Kirkland Nickel Project as part of the implementation of the I-405 Corridor Program. The regional effects on greenhouse gas emissions and ozone formation as well as on CO, HC, and NO_x, have not changed substantially since that analysis; therefore, they are not repeated in this study.

5.1.1 Impacts During Construction

The Kirkland Nickel Project will cause localized and temporary changes in air quality of the types discussed in the *programmatic EIS Air Quality Review.*

Particulate emissions will vary from day to day depending on level of activity, specific operations, and weather conditions. Particulate emissions will depend on soil moisture, silt content of soil, wind speed, and the amount and type of equipment operating. Larger dust particles will settle near the source, while fine particles will be dispersed over greater distances from the construction site.

The quantity of particulate emissions will be proportional to the area of the construction operations and the level of activity. Based on field measurements of suspended dust emissions from construction projects, an approximate emission factor for the construction operations will be 1.2 tons per acre of construction per month of activity (EPA, 1995).

Fugitive dust from construction activities will be noticeable near construction sites if uncontrolled. Construction will require mitigation measures to comply with PSCAA regulations that require the control of dust during construction and preventing deposition of mud on paved streets (PSCAA Regulation 1, Article 9). Measures to reduce deposition of mud and emissions of particulates are identified in the Construction Mitigation Section of the corridor EIS (Section 3.1.6.1) and summarized in Section 6.1 of this report.

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines will generate CO and NO_x in exhaust emissions. If construction traffic reduces the speed of other vehicles in the area, emissions from traffic will increase slightly while those vehicles are delayed. These emissions will be temporary, limited to the immediate area surrounding the construction site, and will contribute a small amount to the total emissions in the study area compared with automobile traffic because construction traffic will be a very small fraction of the total traffic in the area.

Some phases of construction will result in short-term odors, particularly if asphalt is used for paving operations. Odors might be detectable to some people near the construction site. These odors will be diluted as distance from the site increases.

5.1.2 Impacts During Operation

The maximum estimated one-hour CO concentrations from vehicle emissions will range between 5.1 and 6.8 ppm in 2014 and between 4.6 and 6.5 ppm in 2030 (see Table 5-1). The maximum estimated eight-hour CO concentrations will range from 3.6 to 4.8 ppm in

2014 and from 3.2 to 4.6 ppm in 2030 (see Table 5-2). No exceedance of the NAAQS for CO is predicted for the Build Alternative.

Table 5-1: Modeled One-hour Average CO Concentrations

Intersection	2002 Existing Conditions	2014 Build Alternative*	2014 No Build Alternative*	2030 Build Alternative*	2030 No Build Alternative*
I-405 SB on- and off-ramps and NE 70th	8.8	5.3	5.1	4.7	4.6
I-405 NB on- and off-ramps to NE 70th and 116th Avenue NE	7.2	5.1	5.0	4.6	4.9
NE 116th Street and 120th Avenue NE	8.7	6.5	6.4	5.6	5.8
NE 116th Street and 124th Avenue NE	12.8	6.8	8.0	6.5	6.5

**Concentration values are in parts per million (ppm).*

The one-hour NAAQS for CO is 35 ppm.

Table 5-2: Modeled Eight-hour Average CO Concentrations

Intersection	2002 Existing Conditions	2014 Build Alternative*	2014 No Build Alternative*	2030 Build Alternative*	2030 No Build Alternative*
I-405 SB on- and off-ramps and NE 70th	6.2	3.7	3.6	3.3	3.2
I-405 NB on- and off-ramps to NE 70th and 116th Avenue NE	5.0	3.6	3.5	3.2	3.4
NE 116th Street and 120th Avenue NE	6.1	4.6	4.5	3.9	4.1
NE 116th Street and 124th Avenue NE	9.0	4.8	5.6	4.6	4.6

**Concentration values are in parts per million (ppm).*

The eight-hour NAAQS for CO is 9 ppm.

The modeled intersections include all areas affected by the project that are accessible to the general public and where elevated CO concentrations will be likely to occur. Because the project will not cause or contribute to any violation of the NAAQS for CO, it will not cause any adverse localized CO impacts.

By being part of the I-405 Corridor Program, the Kirkland Nickel Project is included in the PSRC regional MTP conformity modeling. Because the MTP has been demonstrated to

conform to the Puget Sound AQMPs, none of the included projects is expected to cause or contribute to a regional violation of the NAAQS. Consequently, the Kirkland Nickel Project will not have an adverse regional effect on air quality.

5.1.3 Indirect Impacts

The air quality analysis for this project is based on the transportation demand forecasting model, including the effects of unmet demand on the transportation system. By including unmet demand, the indirect effects of increased transportation capacity are included in the analysis. There would be no indirect impacts as a result of the Kirkland Nickel Project.

5.1.4 Conformity Determination

FHWA and WSDOT projects must comply with the project-level conformity criteria described in the EPA Conformity Rule, and included in the WAC Chapter 173-420. The regional metropolitan planning organization (MPO) must also include the project in a conforming plan (the MTP) and in a Transportation Improvement Plan (TIP). Per 40 CFR Part 93, the following criteria must be met when determining project conformity. A brief summary of the project's conformity to the State Implementation Plan (SIP) is discussed below with each criterion (indicated by italics):

- *The conformity determination must be based on the latest planning assumptions*. The project hot-spot analysis was completed using the latest version of the Puget Sound region MOBILE 6.2 emission files used by the PSRC. The project hot-spot locations are known to have the highest traffic volumes or poorest traffic operations; which will result in the highest air pollution concentrations.
- *The conformity determination must be based on the latest emission estimation model available*. Emissions to determine conformity to the MTP and TIP were calculated using MOBILE 6.2, the emission model being adopted to model future conformity to the Puget Sound AQMPs.
- *The MPO must make the conformity determination according to the consultation procedures of this rule and the implementation plan revision required by Section 51.396.* The project is in the PSRC Metropolitan Transportation Plan (MTP) but not yet in the TIP. PSRC has completed the conformity determination on the plan per Section 51.396.
- *There must be a current conforming plan and a current conforming TIP at the time of project approval.* There is a current conforming MTP and TIP (January 2001).
- *The project must come from a conforming transportation plan and program.* The project was included as part of the I-405 Corridor Program in the PSRC Metropolitan Transportation Plan (MTP) during the development of the *I-405 Corridor Program NEPA/SEPA Final EIS*.
- *The FHWA project must not cause or contribute to any new localized CO or PM_{10} violation in CO and PM_{10} nonattainment or maintenance areas.* The project is located in a CO maintenance area. The project will not create any new regional violations or contribute to the frequency or severity of any existing violations of the NAAQS. As shown in Table 5-1 and Table 5-2, with the project, CO violations in the project area will remain the same or be reduced in 2030. The project area is in conformity for PM_{10}.

- *The FHWA project must comply with PM_{10} control measures in the applicable implementation plan*. Because the area is in conformity for PM_{10}, no implementation plan is required.

The project is in the PSRC Metropolitan Transportation Plan (MTP) but not yet in the TIP. The project meets the local hot-spot conformity requirements. Because the project has been included in the MTP modeling, it is known to meet regional conformity technical requirements; however, it does not yet meet the procedural requirement of TIP inclusion. Once the project is included in the TIP, it will meet all requirements of 40 CFR Part 93 and WAC 173-420 and demonstrate conformity to the SIP.

5.2 No Build Alternative

5.2.1 Impacts During Construction

With the No Build Alternative, construction would not occur as part of the project; therefore, construction air quality impacts would not be associated with the project.

5.2.2 Impacts During Operation

The maximum estimated one-hour CO concentrations from vehicle emissions with the No Build Alternative would range from 5.0 to 8.0 ppm in 2014 and range 4.6 to 6.5 ppm in 2030 (see Table 5-1). The maximum estimated eight-hour CO concentrations would range between 3.6 and 4.8 ppm in 2014 and between 3.5 and 5.6 ppm in 2030 (see Table 5-2). No exceedances of the NAAQS for CO are predicted for the No Build Alternative.

5.2.3 Indirect Impacts

The air quality analysis for this project is based on the transportation demand forecasting model, including the effects of unmet demand on the transportation system. By including unmet demand, the indirect effects of increased transportation capacity are included in the analysis.

6.0 Mitigation

6.1 Mitigation During Construction

General avoidance measures during construction were discussed in the *programmatic EIS Air Quality Review*. The measures applicable to the Kirkland Nickel Project are summarized here.

Particulate emissions in the form of fugitive dust during construction activities are regulated by PSCAA. Fugitive dust emissions will be ameliorated with the best available control technology (PSCAA Rule 1, Section 9.15). According to PSCAA Rule 1, Section 9.15, fugitive dust from construction activities shall not be injurious to human health, plants and animals, or property, and shall not unreasonably interfere with the enjoyment of life and property. Also, a person may not operate a vehicle that deposits particulate matter on a paved, public highway (PSCAA Rule 1, Section 9.15).

Construction impacts will be reduced by incorporating mitigation measures to avoid impacts into the construction specifications for the project. The following measures will be used to control PM_{10}, deposition of particulate matter, and emissions of CO and NO_x during construction:

- Exposed soil will be sprayed with water to reduce emissions of PM_{10} and deposition of particulate matter.
- Covering all truck loads, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck) in order to reduce PM_{10} and deposition of particulates during transportation.
- Wheel washers will be provided to remove particulate matter that would otherwise be carried off site by vehicles in order to decrease deposition of particulate matter on area roadways.
- Particulate matter deposited on paved, public roads will be removed to reduce mud on area roadways.
- Dirt, gravel, and debris piles will be covered as needed.
- Routing and scheduling construction trucks so as to reduce delays to traffic during peak travel times will be implemented to reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.
- Emission-control devices, including catalysts and particulate traps as appropriate, on all construction equipment powered by gasoline or diesel fuel, will be required to reduce CO and NO_x emissions in vehicular exhaust. Using relatively new, well-maintained equipment will reduce CO and NO_x emissions.
- Other measures may be considered as appropriate.

6.2 Mitigation During Operation

Because the project is not anticipated to cause any adverse impacts, activities to avoid impacts will not be required.

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7.0 Unavoidable Adverse Impacts

Kirkland Nickel Project will not result in any unavoidable adverse air quality impacts.

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